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The knowledge of cardiovascular disease which was very slight at the time of the discovery of the circulation has since come through several channels: (1) the accumulation of data provided by anatomical observation, normal and morbid; (2) unaided clinical observation; (3) as the result of the application of instruments of precision to the examination of patients; and (4) the information derived from physiological and pathological experiments. Though these four headings are attractive as a means of sketching the advance of knowledge, it is in practice difficult, and indeed somewhat inconvenient, to follow them out rigidly or attempt to make them absolutely watertight; there will therefore be much overlapping, as will at once be only too obvious.

I. ANATOMICAL OBSERVATION.

Anatomy is an indispensable step to the more complex science of physiology which explains the vital forces of the body, and this, though it may be helped by anatomy, demands observation of or experiment on the living organism. Frabricius's description of the valves in the veins stimulated Harvey to find out their use by the experimental method. Gaskell's physiological demonstration of the muscular continuity between the auricle and the ventricle was made on reptiles and was supposed to be confined to them until 1893, when the auriculo-ventricular bundle was described in mammals by Stanley Kent and by W. His, junior; in 1906 Tawara gave a full account of the junctional system, including the auriculo-ventricular node and the bundle previously described by Kent and His, the fibres of the bundle being continued into the Purkinje fibres which line the interior of the ventricles and communicate with their muscular fibres; this was followed in 1907 by Keith and Flack's discovery of the sino-auricular node, the normal pacemaker of the mammalian heart; the later anatomical observations were subsequent to and directly stimulated by the needs of the new cardiology, for Mackenzie's epoch-making book on the pulse was published in 1902. Thus it may be noted that, just as medicine is deeply indebted to the experimental method, so also science owes a debt to medicine, and that they two "according well may make one music as before."

The Capillaries.

The tercentenary of the birth of Marcello Malpighi, the father of histology, on March 10th, 1628, and that of the "De Motu" appropriately coincide, for in 1661 he provided the final proof of Harvey's discovery by recognising the capillaries in the frog's lung. He also saw the red blood corpuscles in the mesenteric vessels of a hedgehog, but as he regarded them as fat cells, Antony van Leeuwenhoek, who described them fully in his "True Circulation of the Blood" in 1686, has the credit of their recognition. Johannes Swammerdam, however, had actually noted the presence of red blood cells as early as 1658, but his observation was not made public until 1738, when Boerhaave brought out Swammerdam's "Biblia Naturæ."

After the discovery of the capillaries there was a long interval before this most essential part of the circulatory system received due attention. Thomas Young in 1808 had the foresight to assume as probable variation in the size of the capillaries. The view that the capillary circulation was a mere passive communication between the arterioles and the venules was definitely modified by Stricker's observation in 1865 that the capillaries became constricted from swelling of the endothelial cells. In 1873 Rouget observed on the surface of capillaries the cells which bear his name, and described their contraction. In 1879 Roy and Graham Brown showed that the calibre of the capillaries is constantly changing without corresponding alterations in the arteriolar pressure. The study of the capillary circulation then languished; but the invention of capillary microscopy by Lombard in 1912 again stimulated investigation, and it has now been proved that the walls of the capillaries have independent powers of changing their calibre.

The capillary circulation, thanks to the experimental labours of Dale, Laidlaw, Richards, Krogh, and Lewis,

has been placed in a new light. It appears that the capillary area as a whole is in a constant state of flux; while the greater portion is relatively empty, various parts of it open for a time, so that with a continually changing condition of the constituent portions the average total path remains about the same and maintains the peripheral resistance. Normally only a very small proportion of the whole available capillary area is open, for if it were universally open all the blood would stagnate there. The varying dilatation of the capillaries corresponds, as Krogh demonstrated in muscle, with the needs for it.

Morbid anatomy must also be supplemented by clinical observation or by experiment; the example set by Harvey of always submitting to the test of physiological proof the explanations suggested by anatomy, which is completely instructive only when elucidated by physiological experiment, was followed with regard to morbid anatomy and its correlation with symptoms by Morgagni, Corvisart, Laennec, Hope, and later the experimental results obtained by Claude Bernard, Cohnheim, Roy, Starling, and many others were brought to supplement the teaching of the post-mortem room.

It was not until the eighteenth century, with the publication of observations on morbid anatomy made by Raymond Vieussens (1715), Lancisi (1718, 1740), and Morgagni (1761), and the first treatise dealing specially with diseases of the heart by J. B. de Senac (1749), that cardiac disease was really recognised. Theophilus Bonetus (1620–89), in the first volume of his "Sepulchretum" (1679), collected a number of observations on palpitation and cardiac pain during life associated with polypi in the heart, calculi in the myocardium, inflammation of the heart, acute inflammation, effusion and adhesion of the pericardium, and aortic aneurysm, and thus prepared the way for Morgagni and others. Vieussens and Morgagni recorded a number of valvular lesions, and Lancisi in 1718 described vegetations on the valves and noted dilatation and hypertrophy, but applied the term aneurysm to the former; in his posthumous book (1740) syphilitic lesions of the heart were outlined. De Senac described ulceration, abscess, and inflammation of the heart, "the hairy heart" of acute pericarditis, and in a short chapter malformations.

Corvisart and his pupils, Laënnec and Bouillaud, carried on the anatomico-clinical investigation of cardiac affections, and among the Fellows of this College James Hope (1801–41) set a fine example in this respect.

II. Unaided Clinical Observation.

Under the heading of unaided clinical observation the use of the stethoscope may perhaps be included, as it is artificial to separate the employment of this instrument of precision from that of direct auscultation. In this section the history also is outlined of some cardiac disorders—dyspnœa, angina pectoris, coronary thrombosis, the Stokes-Adams syndrome—which give rise to characteristic clinical pictures. As would naturally be anticipated, the history of cardiac diagnosis shows that in the main recognition and correlation of symptoms came first and the invention of physical methods of examination later. Albertini (1672–1733) of Bologna laid stress on palpitation and dyspnœa as evidence of cardiac disease, and ascribed the latter to venous stasis in the lungs. He also made use of palpation, which was little employed before his time or indeed for a hundred years after, until Corvisart revived it and drew attention to thrills.

Percussion.

Percussion was described by Leopold Auenbrugger (1722–1809) of Vienna in a pamphlet of 22 pages in 1761, the year in which Morgagni's great work on morbid anatomy, "De Sedibus et Causis Morborum," appeared, and so should have been a means of correlating physical signs with gross structural changes. But though praised as worthy of all attention by his senior contemporary, Albrecht von Haller of Berne, and translated into French by Rozière de la Chassagne and published in Paris in 1770, the conservatism responsible for opposition to Harvey's discovery delayed the acceptance of Auenbrugger's percussion. It was thus long before its time, and did not receive any recognition until in 1808, the year before the author's death, J. N. Corvisart translated it into French for the second time.

Auscultation.

Auscultation, though in practice and in our minds dating from Laënnec and the invention of the stethoscope, was not an absolutely new idea in 1819.

The story of the invention of the stethoscope by René Théophile Hyacinthe Laënnec (1781–1826) has often been told: in 1816 he noticed boys in a Court of the Louvre at play with the ear applied to long pieces of wood listening to the transmitted sound of a pin scratch at the opposite end. He immediately put this hint into practice, as he says, by applying a rolled up quire of paper to the chest of a stout girl with symptoms of heart disease, and was electrified by finding that the heart sounds were more audible than to the direct ear. He keenly practised this method at the Necker Hospital, where, however, Granville, as an onlooker on Sept. 16th, 1816, states that the original birth of mediate auscultation actually occurred on the chest of a male patient. Laënnec then devised a wooden cylinder one and a half inches in diameter, a foot long, and perforated longitudinally by a bore three lines wide; this he regarded as too simple to require a name other than "the cylinder" or "bâton"; but eventually, as somewhat barbarous names, such as sonometra, pectorilogue, thoraciscope, cornet de papier, and cornet médical, appeared on the horizon, he suggested, if it must have a name, stethoscope. With his knowledge of morbid anatomy he correlated the local lesions with the corresponding physical signs, like his teacher Corvisart, thus advancing the anatomico-clinical method and the special pathology of the organs, in the extraordinary short time of three years, so that his classical work, "Auscultation médiate," appeared about August 15th, 1819. While correcting the proofs he had been busily making stethoscopes so that every buyer of his book might be properly equipped; in fact, it is probable that at the time of his death every existing stethoscope was the work of his hand (Thayer).

Though the stethoscope has some obvious advantages over the naked ear, the enormous advances that followed its introduction were not so much due to the stethoscope as a mechanical instrument as to the psychological effect that this new method exerted on Laënnec, who otherwise would not have so ardently pursued auscultation as a means of diagnosis. It was much the same with regard to the pleximeter introduced by P. A. Piorry (1794–1879) ("Traité de la percussion médiate" dedicated "Aux mânes d'Auenbrugger, de Corvisart, et de Laënnec") in 1828, which in itself, apart from its temporary influence in stimulating investigation, is inferior as a method of elicitating physical signs to Auenbrugger's direct percussion which it was intended to supersede.

Laënnec's original stethoscope underwent modifications by him, Piorry who reduced the thickness of the stem to that of the finger, C. J. B. Williams, and others. The invention of the binaural was the subject of some dispute as to priority, as is shown in the pages of the *London Medical Gazette* for 1840–41; Sibson used one in 1838, Burne in 1840, and Golding Bird stated that Babington at Guy's had used one for some time. In America, where it was introduced in 1850 by Cammann, its vogue became general much earlier than in this country. Auscultatory percussion, or a combination of the two methods enabling the vibrations produced by percussion to be directly transmitted to the ear by the stethoscope, was advocated by Cammann and Clark in 1840. More modern developments are the phonendoscope and differential stethoscope.

Until auscultation had become somewhat elaborated the diagnosis of heart disease depended on general symptoms, such as dyspnœa, palpitation,

a weak and irregular pulse, and there was not any discrimination in diagnosis. In the posthumous edition of Matthew Baillie's "Morbid Anatomy" (1825) it is stated that "no observations have yet been made by which practitioners can ascertain with any precision what set of valves is diseased." But Laënnec's "Auscultation médiate" (1819) stirred the waters to much purpose. Bouillaud, Hope, Williams, and Elliotson became extremely active in tabulating the physical signs with the valvular lesions and accumulating data—the time, propagation, and characters—so as to determine the significance of murmurs. Hope's "Treatise on Diseases of the Heart and Great Vessels," 1832 (3rd ed., 1839), though somewhat marred by his disputes with Bouillaud, chronicled a most notable advance; having carried on experimental research, he was able to apply physiological principles to unravelling the hæmodynamic problems of cardiac disease.

During the latter half of the last century an exaggerated importance was attached to cardiac, and especially systolic, murmurs as evidence of heart disease. With "the passing of morbid anatomy," or the overshadowing of gross morbid changes by the renewed attention to symptoms and physiological efficiency, there has now resulted a diminution in the importance attached to the physical signs of cardiac disease. But the traditional stress laid on the presence or absence of a murmur as the criteria in determining whether the heart was or was not seriously affected, though qualified by the warnings of W. T. Gairdner (1862), Thomas Watson, Andrew Clark, G. W. Balfour, and others, did not become fully discounted until after the war, and then largely by Mackenzie's insistence.

Cardiac Dyspnœa.

As a result of work done during and since the war, cardiac dyspnœa may be divided into (1) simple in which there is increased irritability of the respiratory centre from oxygen want brought about by diminished blood-supply to the centre; in these cases, occurring in the young, especially with mitral stenosis, and comparatively early, the cyanosis being bright, Fraser, Ross, and Dreyer found a definite alkalæmia, and Lewis and Barcroft noted the absence of acidæmia; (2) cases of a more complicated nature, often arteriosclerotic or cardiorenal, in older people, with myocardial degeneration, dyspnœa occurring later, and the cyanosis being of a leaden hue (Fraser). In these cases there is acidæmia (Lewis and Barcroft) and stimulation of the respiratory centre by the increased hydrogen-ion concentration, the fundamental idea that acidæmia causes breathlessness being directly deducible from Haldane and Priestley's work (1905). These cases manifest true cardiac asthma with a sudden onset which was ascribed by Lewis, Ryffel, Wolf, Cotton, and Barcroft (1913–14) to sudden waves of acidæmia. The attacks are probably much allied to those long known as renal asthma which, as pointed out by Loomis (1873) and Stephen Mackenzie (1889), are greatly benefited by hypodermic injection of morphine. These paroxysmal attacks of cardiac asthma were mentioned by Heberden, who eliminated from his picture of angina pectoris the symptoms of breathlessness; but there is a close relation between the three conditions of angina pectoris, œdema of the lung, and cardiac asthma (Pratt), which may be combined or confused with each other. Hope in 1839 gave an account of cardiac asthma, but rather confused the issue by bringing in ordinary cardiac dyspnœa and Cheyne-Stokes respiration. Clinically James Mackenzie drew special attention to the true cardiac asthma about which scepticism had been expressed. The value of morphine hypodermically in the paroxysmal dyspnœa of cardiac asthma has recently been emphasised (Fraser), and it may be noted that on more general grounds Clifford Allbutt in 1869 recommended morphine in cardiac disease by the then comparatively new method of hypodermic injection, the syringe having been invented by F. Rynd in 1845, and by Alexander Wood in 1855.

Angina Pectoris.

Angina pectoris was first described on a good basis of cases, 20 in number, by the British Celsus, William Heberden the elder (1710–1801), in a paper entitled "Some Account of a Disorder of the Breast" read before this College on July 21st, 1768. In the text he says: "The seat of it, and sense of strangling and anxiety with which it is attended, may make it not improperly called angina pectoris," and his posthumous "Commentarii de Morborum Historia et Curatione," 1802, p. 308, show that altogether he had seen 100 cases. Isolated cases had been reported before this. Seneca in his epistles to Lucilius recorded his own sufferings, which may well have been those of angina sine dolore, and at any rate were by his medical attendants called a "Meditatio mortis," the Earl of Clarendon described the sudden death of his father Henry Hyde in 1632, and Morgagni the case of a woman who died in 1707 with a characteristic distribution of the pain and was found to have a dilated and calcified aorta. Hoffmann recorded another single case "de spasmo præcordiali a motu corporis" in 1734; Rougnon, professor of medicine in the University of Besançon, wrote a letter to M. Lorry dated Feb. 23rd, 1768, a copy of which is in the library of the Surgeon-General of the U.S. Army (Osler), earlier in the same year as Heberden's more complete account, describing a case of angina with a necropsy, and accordingly in France a claim for priority was made for him by Huchard. On Nov. 17th, 1772, two further communications on the subject were made to the College; Heberden read a letter addressed to him by a man signing himself "Unknown," who, having seen an abstract of Heberden's original paper in *The Critical Review*, recognised the resemblance to his own experiences, gave an account of them, considered by Osler as one of the best extant, and expressed a wish that in the event of his death there should be a necropsy; this, when performed by John Hunter, did not reveal anything save slight calcification of the aorta, but Edward Jenner, who was present, wrote to Caleb Hillier Parry, "I can almost positively say the coronary arteries of the heart were not examined." The other, though less dramatic, communication made at this meeting, by John Wall (1708–76) of Worcester, has perhaps hardly received its due mead of attention; for in his letter to Heberden describing the post-mortem examination of a case of aortic stenosis with angina, the first inch of the aorta is stated to have been partly ossified, and the spasm of the pectoral muscle is ascribed to "an irritation on the nerves of the thorax and heart," and the following comment is added: "Perhaps it may throw some light on this affair to consider that the nervi intercostales or sympathetici distribute many branches to the heart, arteria pulmonalis, and aorta." He thus perhaps in the first place anticipated James Mackenzie's view that the pain of angina is partly due to spasm of the intercostal muscles and Charlton Briscoe's suggestion that the spread of pain depends upon irritation of one of the expiratory muscles, and in the second place suggested Corrigan's and Clifford Allbutt's conception of the aortic origin of anginoid pain. The association of coronary disease with angina was first recognised by Edward Jenner from post-mortem examination, though it is possible that John Hunter, on whose account, as his anginal symptoms dated from 1773, Jenner kept silence, knew or suspected it in 1776 when John Fothergill published a fatal case of angina in which at the post-mortem Hunter found that "the two coronary arteries from origin to many of their ramifications on the heart were become one piece of bone." Jenner, who is said to have diagnosed angina in Hunter in 1777 (vide Palmer), never directly published anything on this subject, but he communicated his opinions to C. H. Parry, who in 1788 read a paper, "An Inquiry into the Symptoms and Causes of the Syncope Anginosa, commonly called Angina Pectoris; illustrated by Dissections," to a small medical society in Gloucestershire of which Jenner was a member, and came to the

conclusion that coronary disease was the cause. In this paper, not published until 11 years later, he quoted the case of ossification of the coronary arteries published by Black of Newry in 1795, and pointed out that he and Jenner had independently come to the same opinion in 1788.

The explanation of the causation of angina pectoris by coronary disease was, as pointed out by Osler, given by Allan Burns (1781–1813), the Glasgow anatomist and surgeon, who in 1809 ascribed the symptoms to anæmia, or as it might now be expressed anoxæmia, of the heart muscle resulting from coronary obstruction. This conception is now known as intermittent claudication—a term introduced by Bouley in 1831 in regard to horses and applied to man by Charcot in 1858—and perhaps more intelligibly as intermittent limp (Erb). Benjamin Brodie in 1846 explained angina pectoris on these lines rather more fully, and Potain in 1870 expressed the same opinion. The view that disease of the base of the aorta was one of the causes of angina pectoris, perhaps dimly foreshadowed by Wall (1772) and Baumes of Montpellier (1808), was put forward by Dominic Corrigan (1802–80) in 1837, and by Clifford Allbutt from 1894, with confirmation from our Honorary Fellow, K. F. Wenckebach, in the special lecture he gave in this library on May 5th, 1924, when he accordingly advocated division of the depressor nerve. James Mackenzie considered that angina is due to cardiac failure, a revival of the view held by Parry (1799) and supported by Stokes (1854), and Daniélopolu put forward the slightly different explanation that myocardial intoxication by fatigue products is responsible for angina.

The syndrome of angina pectoris, ascribed to various factors, has been divided into (1) true, organic or major, and (2) functional, pseudo, mock, false, vasomotorial or minor. John Latham (1813) described a spurious form as angina notha; Laënnec (1818), who had two attacks, did not accept coronary disease as the cause, considered mild cases as common, and described it as neuralgia of the heart; Desportes (1813) had previously expressed a similar view; Forbes, the translator of Laënnec's "Auscultation médiate," spoke of organic and of functional angina, subdividing these two main categories. Lartigue (1846) and Walshe independently introduced the term "pseudo-angina," which has not escaped criticism from Allbutt and Mackenzie; Nothnagel in 1867 brought in the term vasomotor angina; and toxic angina, especially that due to tobacco, was described by Huchard. Angina sine dolore, a form of true or major angina, was so named by W. T. Gairdner (1877). The distribution of pain and cutaneous tenderness was investigated by James Mackenzie (1892) and Henry Head.

Excision of the cervico-thoracic sympathetic containing the sensory nerves of the heart and aorta as a means of relieving the pain of angina was suggested in 1899 by François-Franck, the physiologist, but not put into practice until 1916 by Jonnesco of Bucarest. The treatment by amyl nitrite was initiated in 1867 by Lauder Brunton (1844–1916), when a house physician, on the grounds that he found the blood pressure high in an attack and, having heard from Arthur Gamgee that amyl nitrite lowered the blood pressure, logically and successfully employed this drug.

In the tercentenary year of the publication of the "De Motu Cordis" it is interesting to find that the coronary circulation, on which R. Lower, R. Vieussens (1706, 1715), and Adam Christian Thebesius (1708) worked, has been investigated after the Harveian manner. Wearn finds that the blood in the coronary arteries may pass into the Thebesian vessels and so into the ventricles or auricles without entering the capillaries, there being either a direct communication between the coronary arteries and the Thebesian veins, or more probably between the arteries and large veins, and thence into the cavities of the heart. Further, he argues from observations on two cases of gradual complete obliteration of the orifices of both coronary arteries that the Thebesian vessels may take on the new function of supplying the heart muscle with blood from the cavities of the heart, a view to some extent previously expressed by Pratt. The coronary blood flow depends on the arterial pressure, but opinions differ as to the relative importance of the diastolic and systolic blood pressures in the aorta. In this year Anrep and King have shown by experiment that the coronary blood flow is not determined by either the diastolic or the systolic pressures in the aorta singly, but follows closely changes in the arithmetical average of the diastolic and systolic aortic pressures, which in most cases is a sufficiently accurate measure of the true mean pressure.

Coronary Thrombosis.

The syndrome of thrombosis of the coronary arteries, long included in angina, has quite recently been isolated, though Harvey's description of Sir Robert Darcy's case, in his second Disquisition to J. Riolan, in which the wall of the left ventricle was ruptured apparently as the result of "an impediment to the passage of the blood from the left ventricle into the arteries," has now been recognised as an early example (Wearn). The syndrome, first described in 1910 by Obrastzow and Strachesko and again in 1912 by J. B. Herrick, is, now that its characteristic features have been pointed out, obviously a frequent event; this year Parkinson and Bedford published 100 clinical cases, and, in addition, 83 post-mortem cases. Isolated cases had been reported in 1884 by Leyden and even diagnosed by Hammer in 1878, and it is now easy to wonder why coronary occlusion, long recognised pathologically, had not been correlated earlier with a clinical picture. Cases of angina with pericarditis had been recorded (Steell), and the occurrence of the status anginosus, or pain lasting for hours or days in contrast to the pain of angina, which is a matter of minutes, was noted by Huchard. Both these phenomena belong to the syndrome of coronary thrombosis. Rapid and sudden death may be due to ventricular fibrillation or to rupture of the infarcted area as in Harvey's case; recovery may occur, but myocardial failure, cardiac aneurysm, rupture, or recurrent thrombosis may follow.

Stokes-Adams Syndrome.

J. B. Morgagni in 1761 mentioned two men aged 68 and 64 years with slow pulse-rates, one "22 within one-sixtieth part of an hour," dating from the time they were "first attacked with epileptic paroxysms, beginning from the belly"; Heberden in 1768 described a pulse seldom above 30 associated with torpidity; Andrew Duncan described the same events in 1793; Bright in 1831 recorded the clinical features of a case with a necropsy showing a much enlarged heart. The condition was called maladie de Stokes-Adams by Huchard after the two Irish physicians, Robert Adams and William Stokes, who gave accounts of it in 1827 and 1846 respectively and laid much stress on fatty degeneration of the myocardium; indeed, they transferred to that condition many of the symptoms of complete heart-block. This, of course, was long before Gaskell's physiological explanation (1883) of heart-block which is usually, but not invariably, primarily responsible for the syndrome. Galabin in 1875 first published tracings of the independent contractions of the auricles and ventricles, and ten years later Chauveau's tracings also showed this in a man with an auricular rate of 60 to 65, and a ventricular rate of 21 to 24. Osler pointed out the various forms of the Stokes-Adams syndrome, especially the rare cases with gross extrinsic lesions exerting pressure on the medulla or the vagus, such as those of Holberton, Lépine, and Boffard, and to his writings the general recognition of the syndrome is due in no small degree. Recently it has been shown that the ventricle may pass into fibrillation, and that the direct injection of adrenalin into the heart will start the circulation again even if it has stopped for four or five minutes. Subcutaneous injection of adrenalin has been found to arrest the syncopal

attacks (Phear and Parkinson) but not to prevent them. For this purpose Cohn and Levine had recourse to barium chloride by the mouth, which, by increasing the irritability of the ventricle, was successful in preventing the attacks. An interesting account of his own experiences during the last seven years of his life was given by W. T. Gairdner (1824–1907).

III. Instruments of Precision.

Sphygmomanometry.

The history of blood pressure really begins with Stephen Hales (1677–1761), minister of Teddington, who with a sound training in Newtonian physics applied this knowledge to biology and physiology. Before 1723 he tied tubes into the arteries and veins of animals and estimated the pressure in the capillaries, thus being far in advance of his time. In a mare he found that the blood pressure was equal to a column of blood of eight to nine feet. Nearly a century passed before the subject was further investigated, and then Poiseuille (1828) employed a U-shaped mercurial manometer (hæmodynometer).

The clinical estimation of blood pressure by instrumental means was first attempted by Vierordt in 1855 by measuring the weight necessary to stop the arterial pulsation; but von Basch invented a sphygmomanometer on this principle which was applied locally over an artery and was widely used. This underwent modifications, among others by Potain (1889), Marey, Mosso, and Hürthle. Attention should be drawn to F. A. Mahomed's laborious observations on blood pressure made between 1874 and 1881, not with a sphygmomanometer, but with his own form of Marey's sphygmograph, which led him to anticipate much that is now known and far more easily verified; for example, he described a pre-albuminuric rise of blood pressure in Bright's disease, which with von Basch's conception of "latent arterio-sclerosis" and Huchard's pre-sclerosis led up to the recognition of primary or essential high blood pressure or hyperpiesia. The present sphygmomanometric methods became generally available as a result of Riva-Rocci's modification of von Basch's instrument. The publication of Korotkoff's auditory or auscultatory method in 1905 has made estimation of the diastolic pressure both easy and accurate for all conditions except some cases of aortic regurgitation.

The general use of the sphygmomanometer in this country was largely due to Clifford Allbutt, Brunton, and G. Oliver. The greater stability of the diastolic than of the systolic pressure, and therefore its greater diagnostic value, the importance of the pulse or differential pressure, and a correct estimation of the significance of abnormal pressures have gradually become stabilised. Clifford Allbutt described the occurrence of high blood pressure without renal disease, and introduced for this the word hyperpiesia. He also insisted that long-continued high blood pressure may cause, but is not due to, arteriosclerosis.

Estimation of the venous pressure and of the capillary blood pressure has naturally followed.

The Sphygmograph.

The sphygmograph, first invented by K. Vierordt in 1855, and improved by Marie (1860), who did so much to popularise the method of graphic registration, Mahomed (1872), Burdon-Sanderson (1867), R. E. Dudgeon (1882), Pond, von Jacquet, and others, was much used; though the information it provided was somewhat limited, it was the first step in the application to cardiology of the graphic method of record, which has since thrown so much light on hæmodynamics. By means of his clinical polygraph (1902) James Mackenzie, then of Burnley, correlated the arterial and venous pulses with those of the heart, and thus brought order out of the chaos of cardiac irregularities, distinguishing the unimportant, such as the extrasystoles of sinus arrhythmia, from those, such as pulsus alternans, pathognomonic of grave organic disease of the heart muscle.

The Electrocardiograph.

The potential bearings of investigating the electric currents produced by the cardiac contractions, recognised in 1843 by Matteuci of Pisa, and in 1856 by Kölliker and Müller, were examined with the capillary electrometer by Sanderson and Page (1878), Gaskell (1881), Starling and Bayliss (1890), and A. D. Waller. In 1903 Willem Einthoven (1860–1927), of Leyden, first described the string galvanometer which was a great advance on the capillary and other galvanometers, and utilising Waller's observation that curves of the cardiac contractions can be obtained from the limbs of animals without opening the chest, he, as Sir Thomas Lewis says, laid the foundation of human and experimental electrocardiography, and by papers published in 1907 and 1908 led to modern electrocardiography and the final analysis of the arrhythmias. The fundamental knowledge thus acquired by methods demanding delicate instruments it has fortunately been possible to correlate in many instances with simple indications which can be employed at the bedside. Wenckebach, Thomas Lewis, and their followers have thus exactly localised the site of disorders and morbid changes in different parts of the heart muscle, and particularly in the junctional system, such as lesions of the right or left branch of the auriculo-ventricular bundle, and the Purkinje aborisations, thus providing evidence of myocardial degeneration and impending cardiac failure earlier than can be detected by other means of examination.

Auricular Flutter.

Auricular flutter was described as long ago as 1887 by MacWilliam as the result of weak faradisation of the mammalian auricles. Clinically, however, it was not recognised until much later by W. T. Ritchie and by Hertz and Goodhart. A healthy auricle responds to a single stimulus by a single contraction; but if the refractory period of a ring of muscle, as in the auricles, is shortened, the wave of contraction travels round continuously and is spoken of as a circus movement. This physiological observation of G. R. Mines was further elucidated as the condition in auricular flutter by Thomas Lewis and his co-workers. The auricles contract extremely rapidly—200 to 300 or more times a minute, the ventricular rate being usually half that. The treatment consists in the production of a certain degree of heart-block by digitalis, or more radically by directly acting on the muscular tissue of the auricle by quinidine sulphate.

Auricular Fibrillation.

The development of knowledge about auricular fibrillation illustrates the close interdependence of clinical medicine and experimental work. Auricular fibrillation, long familiar to physiologists, was first recognised in man by Cushny and Edmunds in a case under their care in 1901 and published in 1906, the fibrillation being ascribed to vagal inhibition; but their diagnosis of fibrillation was received with doubt. In 1902 Mackenzie had recognised the complete irregularity of the pulse now known to be characteristic of auricular fibrillation, and on the ground of the absence of the auricular wave in the jugular tracings argued that the auricles had ceased to contract and were paralysed. In 1907 he abandoned the idea of paralysis, as in some cases at any rate the muscular fibres of the auricles were found by Keith to be hypertrophied, and argued that the auricular and ventricular contractions occurred simultaneously as the result of irritability of the auriculo-ventricular node, and called this "nodal rhythm." In 1910 Rothberger and Winterberg, and Lewis, by means of the electrocardiograph, proved that the auricular condition was one of auricular fibrillation. The condition of nodal rhythm or simultaneous contractions of the auricles and ventricles due to the stimulus starting in the auriculo-ventricular instead of in the sino-auricular node occurs, but is uncommon.

Auricular flutter and auricular fibrillation are closely related and in the same heart one may be transformed into the other; thus under quinidine

fibrillation returns through impure and occasionally pure flutter to a normal rhythm (Lewis, Drury, Iliescu, and Wedd). They are both due to circus movement in the auricles depending on shortening of the refractory period in the muscle-fibres. But in auricular fibrillation the refractory period of the muscle is shorter and as a result the path taken by the circus movement is shorter than and more irregular than in flutter (Lewis, 1921). The muscle-fibres of the auricle contract independently of each other and much more rapidly than in flutter. The auricle fibrillating at the rate of 450 times a minute overwhelms the conducting capacity of the auriculo-ventricular bundle, so that some only of the impulses reach the ventricle, and these are so irregular that the characteristic pulse results.

Quinidine sulphate and digitalis relieve the subjects of auricular fibrillation in different ways; Mackenzie showed the value of digitalis in auricular fibrillation while recognising that it did not restore the auricular contractions, and Cushny and others proved that it acted by inducing a certain amount of heart-block. An enormous amount of experimental work has been done upon the action of digitalis on the heart of cold- and warm-blooded animals, the effects on the two being different. In the mammalian heart contractility and inhibition are increased and then conduction is impaired.

The observations of Lewis and his co-workers upon the action of certain drugs upon fibrillation of the auricles in 1922 showed that quinidine sulphate lengthens the refractory period and so, by closing the gap between the wake and the advance of the circulating way, tends to abolish auricular fibrillation; but in addition it has the antagonistic effect of slowing conduction and so widening the gap between the successive waves. Successful treatment therefore depends on the first effect being predominant, and so enabling the normal pacemaker to regain control.

Paroxysmal Tachycardia.

Paroxysmal tachycardia was described by Cotton (1867), called tachycardia by Gerhardt (1881), received its full title from Bouveret (1889), and was critically considered by Herringham (1897). The polygraph and the electrocardiograph in Mackenzie and Lewis's hands have thrown much light on this clinical syndrome, showing that it is not simply an acceleration of rate, but that the rhythm is abnormal as a result of the stimulus originating not in the sino-auricular node, but elsewhere. The ectopic stimulus may start in the auricle, so that transient attacks may be due to accelerated nodal rhythm (Lewis), to auricular flutter, to auricular fibrillation, or may even originate in the ventricle.

IV. Physiological and Pathological Experiment.

Essential in all branches of medicine, in none except in neurology has experimental physiology been more inseparably connected with progress than in the cardiovascular system. Clinical observation alone, though in the hands of the greatest intellects, has laboured long and often ineffectually, but when aided and corrected by experimental control has rapidly brought about an advance in cardiological knowledge. This difference in the results given by these two ways—clinical observation and experiment—of obtaining new knowledge in medical science, which is so disappointing to the pure clinician that he may not unnaturally contest the statement, depends on the inherent potentialities of the two methods; in clinical observation the conditions cannot be arranged to meet the exact requirements as can be done in a laboratory. The clinical ward has been called the physician's laboratory, but obviously this phrase does not provide the same opportunities for the exact determination of the questions, which are available by the sharp-cut experiments of the physiological laboratory. On the other hand, some care must be taken in transferring the results on animals to the more complex conditions in man. As disease, according to Claude Bernard's definition, is a physiological reaction in altered circumstances, it is obvious that the laws of these reactions can be much more surely established and the modifying circumstances varied and controlled by well-considered animal experiments. Further, animal experiments prepare the way for the application of somewhat similar methods to man, thus Stephen Hales's experiments on blood pressure find their clinical representatives in the modern sphygmomanometers, Marey's tambours, and Mackenzie's polygraph; the observations of electrical changes in muscular contraction eventually led up to the electrocardiograph. Gaskell (1883) proved that the cardiac contractions arise in the muscular tissue independently of the nerves and ganglia, and that the auricles and ventricles have their own automatic rhythm, though normally obedient to the influence of the sinus. This was to some degree foreshadowed by Harvey's observation that if the ventricle of an eel or of various fishes is cut into pieces contractions continue to occur in the several portions. It must not be forgoten that the recognition in 1672 of muscular irritability by Harvey's fellow-Caian, Francis Glisson (1597–1677), which was revived by Albrecht von Haller (1708–1777), who in 1757 stated that the cardiac contractions originated in the muscle, was the first step in the recent elucidation by Gaskell in physiology and in pathology by Lewis and others of cardiac problems.

Although in his second letter to Riolan in 1649 Harvey showed that he was familiar with local disturbances in the character of the cutaneous circulation, it was not until long after the great conception of the circulation as a whole was established that its local characters received special consideration. The effects of embolism, studied by Virchow (1846–56), and independently in this country by W. Senhouse Kirkes (1852), led, from the resulting lesions, to the realisation of end-arteries in the kidney and brain on the one hand, and on the other hand to the recognition of the peculiarities of the circulation in the spleen, lung, and liver, the two last having nutrient arteries (bronchial and hepatic) in addition to the vessels (pulmonary artery and portal vein) conveying blood to be modified in those viscera.

Splenic Circulation.

Nearly 50 years ago Roy pointed out that the splenic circulation differs from that of other organs in the important particular that the force which drives the blood through the organ is not the arterial blood pressure, but chiefly, if not exclusively, the rhythmic contraction of the muscular fibres in the splenic capsule and trabeculæ. Barcroft's observations suggest that in the spleen there are alternative circulations, and that the blood of the large splenic artery may either (1) when not required elsewhere, as it is in the emergencies of exercise or hæmorrhage, accumulate in the splenic pulp, there to undergo changes; or (2) rapidly traverse a by-pass, and incidentally, like the bronchial arteries to the lungs and the hepatic artery to the liver, maintain the nutrition of the viscus. The blood stored in the spleen may contain as much as a quarter of the red cells, and, as shown by Barcroft's experiments with CO poisoning, be practically cut off from the general circulation and so remain free from a poisoned state ruling elsewhere. Anoxæmia stimulates the smooth muscle-fibres in the spleen and so drives out the resting blood; it thus, as Henry Gray (1854) pointed out, regulates the quantity and quality of the circulating blood. While serving as a reservoir the spleen also acts as a metabolic refinery for the red blood cells and a manufactory for the white cells. The resting blood in the spleen deposits any foreign matter, such as bacteria, protozoa, and cells of malignant growths, which may either be destroyed, the process being an immunological asset, or remain and by multiplying there account for the splenomegalies of chronic diseases, such as malaria, kala-azar, "splenic anæmia." As an important storehouse of reticulo-endothelial cells the spleen is concerned with the destruction of the red blood corpuscles, increasing their fragility by what Bottazzi (1895) called

its hæmokatatonistic function, and plays an important part in the first stage of the transformation of effete hæmoglobin into bilirubin.

Wearn's even more recent evidence that the blood in the coronary arteries has alternative circulations, either through the capillaries into the coronary sinus, as usually considered, or directly into the Thebesian or other veins and so into the cardiac cavities, is of obvious importance in connexion with angina pectoris.

These data have a bearing on the question of the reserve power of the organs, which in the past has been regarded as mainly or entirely quantitative in character. Now it would appear that the reserve power may also depend on the utilisation of potential alternative courses of the circulating blood, and that in pathological conditions compensatory processes may maintain the reserve of an organ, as has been mentioned in the case of the heart in coronary obstruction, and is perhaps also shown in the increased size of the hepatic artery in cirrhosis of the liver. The variations in the state of the capillaries—full or empty—in different areas of the body, which Thomas Young clearly anticipated in his forgotten Croonian lecture before the Royal Society in 1810, have been recently brought out by the work of Krogh, Lewis, Dale, and others.

A more accurate knowledge of the unit blood-supply of the kidney and liver is important so as to understand the mechanism and distribution of changes likely to result from blood-borne toxæmias or septicæmias and from chronic vascular disease. With the help of X rays and radio-opaque injection mass, normal and pathological kidneys have been investigated with results encouraging as regards further knowledge about differences between arterio-sclerotic and glomerular nephritis (Graham).

Coronary Circulation.

The coronary arteries are provided with vaso-constrictor nerves from the vagus, and vaso-dilator from the sympathetic (Anrep). Adrenalin undoubtedly dilates the coronary arteries of animals usually employed in laboratory experiments; accordingly Büdingen, at the suggestion of Morawitz and Zahn, treated cases of angina pectoris with hypodermic injections of adrenalin, but the results were negative. Barbour (1912) found that the action of adrenalin causes vaso-constriction of rings of human coronary artery, thus differing from its effects in laboratory animals, and with Prince showed that in the monkey this difference also holds good, the coronary arteries of these two species being presumably supplied with constrictor fibres from the true sympathetic. Reference has already been made to Wearn's observations on the alternative courses in the coronary circulation.

Pulmonary Circulation.

The questions whether or not the branches of the pulmonary artery (1) are under the control of the vasomotor nerves and (2) are acted upon by drugs in the same manner as the systemic vessels are obviously of practical importance in connexion with the causation and treatment of hæmoptysis and pulmonary œdema. The need of an authoritative lead from physiology on these points was very clearly expressed by James Andrew in his Harveian oration of 1901. Vasomotor innervation of the pulmonary vessels was denied until 1871 when Brown-Séquard, who on experimental grounds argued that lesions of the pons caused hæmorrhages, and injuries of the medulla oblongata œdema of the bases of the lungs as a result of impulses transmitted through branches of the sympathetic leaving the cord in the upper dorsal region. Rose Bradford and Dean (1889, 1894) found that in the dog vasomotor nerve-fibres derived from the upper dorsal nerves supply the pulmonary blood-vessels, though the pulmonary vasomotor mechanism is poorly developed as compared with that regulating the systemic arteries. They also concluded that the pulmonary circulation is comparatively independent of the systemic, and that alterations in the blood pressure of the latter must be so considerable as to interfere with the action of the cardiac valves and produce regurgitation before affecting the pulmonary blood pressure. On the other hand, Brodie and Dixon in 1904 denied the vasomotor control of the pulmonary circulation, and in 1928 Dixon and Hoyle confirmed this. In the meanwhile Führer and Starling, using the heart-lung preparation, found a considerable degree of pulmonary vaso-constriction and a rise of pulmonary arterial pressure with adrenalin, and in 1905 François-Franck came to a similar decision. In a critical review of the extensive work on the subject Wiggers in 1921 concluded that reflex vasomotor effects on the pulmonary circulation must be regarded as probable rather than proved.

The Intracranial Circulation.

The intracranial circulation is remarkable for the rigid cranial cavity and the water-bed of the cerebro-spinal fluid. Whether or not the nerves accompanying the cerebral vessels exert a vasomotor function has been repeatedly investigated, but with discordant results; Roy and Sherrington (1890), L. Hill (1896), and more recently Florey (1925) who found that the cerebral arteries and the cerebral ends of the capillaries react to mechanical, thermal, electrical, and chemical stimuli by contraction and dilatation, agree that there is not any evidence of nervous control over the cerebral vessels. On the other hand, the existence of active functional control of the cerebral vessels by vasomotor nerves has been supported by Claude Bernard (1858), Nothnagel (1867), Wiggers (1915), Forbes and Wolff (1928), and others. The experimental observations are of much interest in connexion with the belief held by many clinicians that transient paralyses, such as occur without evidence of a gross lesion, may be due to spasm of the cerebral arteries analogous to that in Raynaud's disease. Osler (1911), in describing transient attacks of aphasia and paralysis in states of high blood pressure and arterio-sclerosis, accepted the view put forward by Peabody (1891), W. Russell (1909), and others that they were due to transient spasm. Florey has thrown out the suggestion that possibly in pathological conditions, such as arterio-sclerosis, an abnormal metabolic product which has not any effect on normal blood-vessels, may produce spasm of damaged arteries.

The influence of the conditions of the cerebral circulation on the general blood pressure has been much discussed. Starling and Anrep (1925) showed that when imperfectly supplied with blood the vaso-motor centre brings about a compensatory rise of blood pressure, thus confirming Cushing's earlier demonstration in 1901 that the vasomotor centre exerts a regulating influence whereby anæmia of the medulla oblongata is prevented when the intracranial pressure is increased above that in the cerebral vessels. This was supported by Bordley and Baker's (1926) observation that in arterio-sclerosis a high blood pressure was definitely associated with sclerosis of the arterioles of the medulla; this, however, was contested by Keith, Wagener, and Kernohan, and Cutler's observations showed that gross vascular changes in the blood-supply to the medulla were not responsible for blood-pressure changes. Experimentally Florey, Marvin, and Drury (1928) found that lowering the blood pressure in the circle of Willis has not any influence upon the general blood pressure.

ASTHMA CLINIC AT BIRMINGHAM.—The governors of Birmingham General Hospital are about to establish a clinic for the treatment of asthma, and will appoint a research worker to make a methodical investigation into the disease.

FAMILIAL LONGEVITY.—On Oct. 11th Mrs. Mary Maidment celebrated her 102nd birthday in the village of Treyford in north-west Sussex. A native of Shaftesbury in Dorset, she belongs to the third centenarian generation of her family, her mother living to be 104, and her maternal grandfather to 100. The elder of Mrs. Maidment's two surviving sons is nearly 80 years of age, and she has two brothers, aged 91 and 84, and a sister aged 81.

THE CILIARY MOVEMENT OF THE TRACHEA STUDIED IN VITRO.

A MEASURE OF TOXICITY.

BY LEONARD HILL, M.B. LOND., F.R.S.

(From the National Institute for Medical Research, Hampstead.)

WHILE Purkinje and Valentine discovered ciliary movement in reptiles, birds, and mammalia, Sharpey,[1] by placing the parts in tepid water and using charcoal powder as an index, proved that the direction of this movement in the air passage of mammalia and birds was towards the larynx. Ciliated cells, like white blood corpuscles, are tenacious of life, and live outside the body under suitable conditions for a long time. Sharpey recorded ciliary movement in the tortoise 15 days after death, and in the fresh water mussel movement continued until putrefaction destroyed the gill tissue. Cilia were observed in action by Gosselin [2] in the upper part of the trachea of an executed criminal up to 56 hours after death at a temperature 8–12° C. In another corpse kept at 20° C. the movement did not last so long.

Method.

The trachea of the horse, ox, or sheep, obtained immediately after slaughter and wrapped in a damp cloth to prevent drying, is brought to the laboratory and there cleaned from accessory tissue and cut up into convenient lengths—e.g., about two or three inches; these sections are put into a basin containing Ringer's solution and stored in the cold room or ice-chest. The cilia of the horse trachea remain active for two or three days; even after four days a slow rate of movement may be found.

A length of trachea is taken from the cold room when wanted and cut longitudinally into strips about half an inch wide. The mucous membrane of the posterior part of the trachea, between the cartilages, falls into longitudinal folds and is rejected. A strip of the cartilaginous part is extended by means of pins on a flat sheet of cork, so that the mucous membrane is evenly stretched and quite smooth. The cork is cut to fit the bottom of the basin and is fixed there by a wedge, and the strip of trachea placed exactly in the horizontal position is then covered with Ringer's solution which has been warmed to body temperature; the basin is placed on a metal box under which there is an incandescent electric lamp so arranged as to keep the solution in the basin at body temperature. The Ringer's solution may be aerated occasionally, but oxygen need not be bubbled through it. A very fine suspension of lamp black (de Haen's Hydro-Kollag 150) is used as index of ciliary movement. So fine and even is the suspended powder that it has been used for circulation through the blood capillaries. A little of this suspension diluted with water four or five times is placed on the strip of trachea by means of a teat pipette. Immersed in Ringer at body temperature, the cilia swiftly and cleanly carry the black suspension along the mucous membrane at a rate which may be as fast as 3 cm. in one minute. A wooden centimetre measure is affixed by pins just over and along the strip of trachea, and by means of this and a stop-watch the rate of transit is ascertained and recorded. The drop of black suspension is not only carried along but cleaned right off the strip; a new one can then be put on and the process repeated over and over again.

A powder that flocculates is not carried along so easily as a powder that remains discrete. Finely powdered zinc oxide, barium carbonate, bismuth carbonate, calomel, casein, animal charcoal, iron filings and aluminium filings are carried along well. Lime or sodium bicarbonate stop the cilia by their alkalinity. An inert powder will not be conveyed over a patch after lime has been applied and washed off. Calomel, and silica in the free state, have no injurious effect, even when kept in contact with the cilia overnight.

Kuhne [3] found that cilia were stopped by lack of oxygen—e.g., when a stream of hydrogen was bubbled through the containing water. The cilia could obtain oxygen from oxyhæmoglobin and continue movement until it was all reduced. They were stopped also by a stream of carbon dioxide which made the water acid, and recovered when air or a little ammonium carbonate was added. They were stopped by weak acetic acid and restored by ammonium carbonate sufficient to neutralise the acid. Similarly, when stopped by too much alkali, they were restored by acid.

Ringer's solution, made according to Evans and Underhill's prescription, was at first employed, and oxygen bubbled through it.

Sodium chloride	8·5 g.
Potassium chloride	0·42 g.
Calcium chloride	0·24 g.
Sodium phosphate	0·6 g.
Molar phosphoric acid	0·4 c.cm.
Distilled water..	1000 c.cm.

Later it was found sufficient to employ ordinary Ringer or physiological saline solution without oxygen. Even tap water suffices for an hour or two. The cilia stopped movement when a stream of coal gas was passed through the trachea for one minute, but renewed it on aeration in Ringer's solution.

Results of Experiments.

Rate of Transit.—The cilia of the trachea of the horse, sheep, rabbit, and hen, and the gullet of the frog produce much the same rate of transit, about 1 cm. in 20–30 seconds under the best conditions. The rate in the trachea of small animals such as the rat appears to be slower—e.g., 1 cm. in 2–2½ minutes. In a trachea taken from the post-mortem room a rate of 1 cm. in four minutes was found; the conditions for survival in full vigour had no doubt been unfavourable.

According to Gray, the effectiveness of ciliary movement upon particles placed at a distance of more than four or five times the length of the cilia becomes very small; the average amount of energy imparted to 1 c.cm. of water in unit time by cilia lining a tube is inversely proportional to the radius of the tube. Thick mucous viscid secretion delays the cleansing action. In the gullet of the bull-frog the rate increased from 1 cm. in four minutes to 1 cm. in 45 seconds after such secretion had been removed with a camel hair brush and Ringer's solution.

It is noteworthy that the ciliated mucous membrane can translate not only material, but also itself under suitable conditions. If a strip of mucous membrane from the frog's gullet is hung over a wet horizontal glass rod it will travel along the rod from end to end. The cilia of the gullet of the bull-frog are powerful enough to convey the stomach of the frog if this be cut out and put upon it. They will easily convey a greased 5 g. weight and will slowly move 10 g. and even 15 g. if the gullet is stretched smoothly and horizontally. The work performed by and efficiency of cilia is fully discussed by J. Gray.[4]

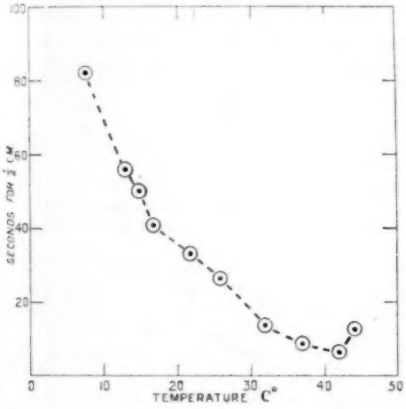
Rate of Movement up the Vertical Surface of the Trachea.—A piece of trachea from a freshly killed horse was stretched vertically in a jar in a moist atmosphere and incubated at body temperature. The mucous membrane was moistened with a little Ringer's solution. A drop of black suspension travelled up at the rate of 1 cm. in 40 seconds; in the horizontal position the rate was 1 cm. in about 20 seconds.

Effect of Stretching the Mucous Membrane.—Races can be run between two strips of horse trachea placed side by side. If the mucous membrane be well stretched and smooth the rate will be the same in each piece; in an unstretched piece the transit is slower. 4 cm. of a stretched piece may even be covered in the same time as 2 cm. of an unstretched piece. The trachea can be lengthened 20 to 25 per cent. by stretching.

The secretion of mucus and its transportation by cilia play an important part in the process of food collection of invertebrate animals. Mucus spread out in a thin layer provides an efficient method of capturing and retaining particles, and is easily transported by cilia. In amphioxus the particles become caught in thin

sheets of mucus, which are often worked up into a long cylindrical mass which travels as a whole.[5] In the trachea of the sheep or rabbit one may see a sheet of thin mucus entangling the black suspension and being pushed up as a cylinder through the larynx as far as the epiglottis. Sometimes the particles of the black suspension cling to networks of stringy mucus, and these become aggregated into clumps, which under normal conditions no doubt may be coughed up. These networks are seen when the mucous membrane is in less good condition. The fresh mucous membrane sweeps itself clean.

FIG. 1.



Injury.—If a small cut be made in the mucous membrane some of the black suspension becomes arrested in transit at this spot while the remainder sweeps round on either side. If two short transverse cuts be made, leaving a central undamaged portion, the black suspension travels through this portion. If a third cut be made beyond the other two and extending over the width of the passage left between the other two, transit is stopped.

Concentration of Dust and Microbes at a Damaged Spot.—If a small area be damaged by a cautery or by a poison such as oxide of mercury or lime, the black suspension is arrested at this spot while cleaned off elsewhere. The experiment illustrates how dust and microbes swept up by the ciliated membrane become concentrated at a damaged spot.

Separation of Mucosa.—If a small area of mucous membrane is separated from the submucosa and replaced the rate of movement continues the same in this as in other parts of the membrane. It is claimed [6] that the movement of cilia in the gullet of the frog is accelerated by stimulation of the sympathetic cord in the region of the brachial plexus, and by the injection of epinephrine and that, on the other hand, it is retarded by stimulation of the medulla oblongata, after this had been isolated from the rest of the neuraxis so that the seventh and ninth nerves alone were excited. It is also claimed that slowing resulted from the injection of pilocarpine.

Gray says that the movement of cilia is generally uninfluenced by the presence of an electric field, but Segerdahl [7] has found that a current of 1 milliampère per sq. cm. passed from the base to the tip of the gill of Anodon increased the rapidity of the action, while the reverse brought the cilia to rest. The response depends to some extent upon the strength of the current used. It seems possible that the results cited above were not due to nervous stimulation, but to spread of current to the cilia.

Effect of Temperature.—This is pronounced, and can be studied by changing the bath of Ringer's solution. Thus—

1 cm. was covered in	165 secs. at 8·5° C.		1 cm. was covered in	52 secs. at 26° C.	
	112 "	13° C.		28 "	32° C.
	101 "	15° C.		17½ "	37° C.
	82 "	17° C.		15 "	42° C.
	67 "	22° C.		25 "	44° C.

Between 32° and 42° C. the rate of transit is approximately doubled (Fig. 1). At about 43° C. the effect on the cilia of the horse trachea became unfavourable. In the case of the trachea of the fowl a temperature of 44° C. proved most favourable. The rate of movement of small particles by the frontal cilia of the mussel Mytilus is, according to Gray,

	mm. per sec.		mm. per sec.
At 5° C.	0·08	At 22·5° C.	0·70
10° C.	0·15	25° C.	0·86
15° C.	0·40	30° C.	1·17
20° C.	0·60	32·5° C.	1·33
			= 0·8 cm. per min.

After 35° C. these cilia become less efficient and go into heat coma at 40° C. and heat rigor at 45° C. The maximal speed of the cilia of the frog's gullet is at 35° C., and heat rigor occurs at 45° C. (Gray, p. 78.)

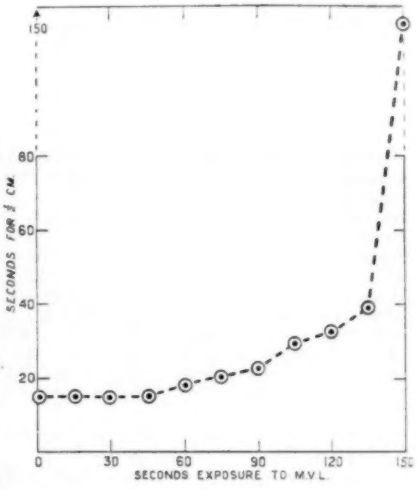
Effect of Ultra-violet Rays.—A frog's gullet was exposed to a mercury-vapour lamp 33 cm. distant with and without a glass screen. After four minutes' exposure the cilia in the unscreened gullet stopped movement, but those under the glass screen remained unaffected.

Horse Trachea Exposed to Mercury-vapour Lamp at 1 ft. : Rate of Transit.

Before exposure	1 cm. in	30 secs.
After 30 secs. exposure	"	30 "
" 60 "	"	36 "
" 90 "	"	45 "
" 170 "	"	63 "
" 135 "	"	78 "
" 150 "	"	290 "

The lamp stopped the cilia of the exposed horse trachea in about five minutes. When it was screened with the mesentery of a rat it was stopped in about 30 minutes, and when screened with Vita-glass in about 60 minutes. It took eight times as long to stop infusoria screened by the mesentery as when they were exposed in an unscreened quartz chamber, while a screen of the bladder or shaved abdominal skin of the rabbit protected them (Fig. 2).

FIG. 2.



Small doses of ultra-violet rays do not accelerate ciliary movement; larger ones slow and stop the cilia.

Vitamin Deficiency and Ciliary Action.—Eight young rats just weaned were fed on a vitamin A and D deficient diet; they ceased to grow and developed xerophthalmia, with inflammation of ears and tail. They were then killed and their tracheas tested against those of four normal rats. The black suspension was conveyed at an average of 1 cm. in 2 min. 25 sec. in the normal and 1 cm. in 2 min. 15 sec. in the vitamin A and D deficient rats.

The rate of ciliary movement, therefore, was not affected by a vitamin A and D deficient diet.

Effect of Drugs.

Purkinje and Valentine observed, says Sharpey, that watery infusions of opium, belladonna, capsicum, catechu, aloes, musk, gum arabic, acetate of morphia, and nitrate of strychnia had no effect on the cilia. Movement was arrested by a 10 per cent. hydrocyanic acid solution, by acid, alkali, and salt in abnormal concentration, and by a certain concentration of

alcohol, ether, sugar, empyrheumatic oil, creosote, muriate of baryta, sulphate of quinine, infusions of pyrethrum, and muriate of veratrum. J. Gray says that the supply of available energy of the cilia of Mytilus is augmented by veratrum and by increasing the K and OH ions and by lessening Mg ions. While cilia are sensitive to the hydrogen-ion concentration the concentration required to arrest them depends on that to which they are normally exposed.

I. W. Hach,[8] by means of a suitable preliminary operation, has made a bronchus of the lower lobe of the lung of the dog available for the introduction of lycopodium spores stained with fuchsin. The spores were introduced when the animal was not under narcosis, and the time of their arrival at a tracheotomy wound was noted. The average rate of transit was about 0·5 cm. a minute. He claims that an injection of morphia into the dog made the rate slower, and of caffeine quicker.

The effect of drugs on the horse trachea can be studied by adding them in known dilution to the Ringer's solution, and that of anæsthetics and poison gases by exposing the strip of trachea for a given time in a vessel full of air containing a known percentage of the vapour or gas.

Absolute Alcohol.—There was no evidence that alcohol brought about an increased rate of movement. In 0·2 per cent. alcohol by volume the rate was 28 secs. for 1 cm.; in 0·4 per cent., 28 secs.; in 1·0 per cent., 26 secs.; in 0·6 per cent., 30 secs. Again, the rate was 1 cm. in 24 secs. in Ringer's solution at 38° C.

Per cent.		Secs.		
1, 2	Absolute alcohol by volume.	1 cm. in 24 at 38° C.		No effect.
3		1 cm. in 38		Increasingly slow.
4		1 cm. in 48		Increasingly slow.
		1 cm. in 100		Increasingly slow.

The cilia may recover in pure Ringer's solution. Again—

Per cent.		Secs.	
0·5	Absolute alcohol by volume.	1 cm. in 29	At 36·5° C. (See Fig 3.)
1·0		1 cm. in 31	
1·5		1 cm. in 32	
2·0		1 cm. in 43	
3·0		1 cm. in 60	
4·0		1 cm. in 85	
5·0		1 cm. in 142	

Some absolute alcohol was poured on a piece of trachea and then washed off with Ringer. As the cilia were still active they must have been protected by the layer of mucus, the mucin of which becomes coagulated by the alcohol. The cilia of the horse trachea may slowly move in Ringer's solution containing 10 per cent. by volume of absolute alcohol, but there is no movement in 20 per cent. alcohol. 10 per cent. of absolute alcohol stopped the cilia of a fowl's trachea, and 5 per cent. stopped those of a rabbit's trachea. Infusoria were slow in 5 per cent. and stopped in 10 per cent. absolute alcohol. It is known that white corpuscles continue to show amœboid movement in 10 per cent. of alcohol.

A weak percentage of alcohol has no effect and a strong one retards ciliary movement.

Oil of Eucalyptus.—Oxygen was bubbled through a wash bottle containing water and some eucalyptus oil, and then through Ringer's solution in which was a piece of horse trachea. There was no effect on the rate of ciliary movement. Some drops of eucalyptus oil were added to the basin and stirred up in the Ringer's solution; the rate became slower and movement stopped after about 30 minutes.

Two pieces of horse trachea were raced one against the other. Each carried the black suspension along 1 cm. in 23 secs. After two minutes' exposure of one under a bell-glass to a strongly smelling eucalyptus vapour there was no difference in rate.

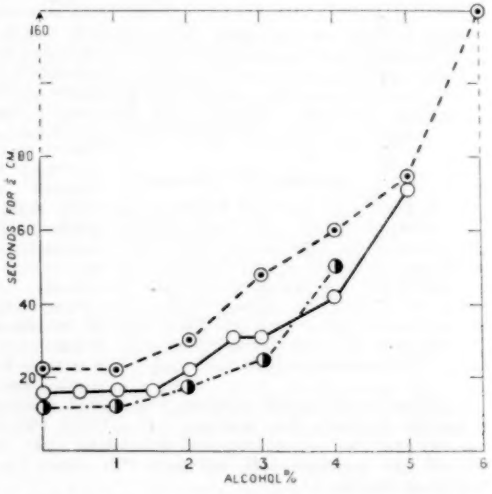
Vapour of eucalyptus appears to be harmless to cilia.

Ether and Chloroform Contrasted.—The ciliary movement in two pieces of horse trachea was raced and found equal. One piece was exposed to strong ether vapour. After three minutes' exposure there was no difference. After five minutes' exposure the movement was 30 per cent. slower on first trial, but on second trial there was no difference, recovery in pure air having quickly taken place. Exposure for one minute to strong chloroform vapour caused slowing of the rate, and there was no quick recovery.

The movement in a piece of horse trachea was active after three minutes' exposure under bell-glass to air saturated with ether. The movement stopped after similar exposure to chloroform. When either ether or chloroform were poured over a piece of trachea and then at once washed off in Ringer the ciliary action was stopped.

A rat was killed with ether under a bell-glass and left there for three-quarters of an hour. After the trachea had been excised and put in aerated Ringer the ciliary movement produced a transit of 1 cm. in two and a half minutes. A rat was made almost moribund with ether and the trachea excised. The rate of ciliary movement was 1 cm. in one and a half minutes. The rate in a piece of horse trachea in Ringer's solution at 35° C. was 1 cm. in 24 secs. The Ringer's solution was saturated with ether, the rate at first was unchanged, but after five minutes it was 1 cm. in 55 secs. In fresh aerated Ringer it became 1 cm. in 26 secs.

FIG. 3.



Water saturated with ether contains 1 in 12 at 17½° C.

In a rabbit under urethane the trachea was opened in situ and the interior moistened with Ringer's solution; the black suspension travelled 1 cm. in 35 secs. Wool saturated with ether was then placed over the tracheal opening so that the animal inhaled the vapour; the rate of transit became 1 cm. in 58 secs., but quickened after the removal of the ether to 1 cm. in 30 secs.

The ciliary movement in a piece of horse trachea was 1 cm. in 24 secs. in Ringer's solution at 35° C.; five minutes after the Ringer's solution had been saturated with chloroform the rate of movement was 1 cm. in four minutes. In fresh aerated Ringer it became 1 cm. in 35 secs.

Chloroform is much more poisonous to cilia than ether. The cilia survive exposure to either used as an anæsthetic, the rate of movement being little affected by ether.

Caffeine.—1 per cent. of caffeine in Ringer's solution produced no acceleration of the ciliary movement.

Urethane.—A rabbit was killed by excessive dose. The cilia were active, as shown by a rate of 1 cm. in 43 secs.

Isopropyl Alcohol.—In 5 per cent. solution cilia continue to be active; in 10 per cent. they almost stop.

Acetone.—A solution of 0·5 per cent. stops infusoria. The cilia of the trachea continue to move slowly, even in 10 per cent.

Octyl Alcohol.—When 0·1 per cent. was used to lower the surface tension of the Ringer's solution there was no difference in ciliary movement.

Ammonium Carbonate.—Up to 1·5 per cent. in Ringer's solution had no effect on the rate of movement.

Ammonium Chloride.—In a 0·25 per cent. solution this had no effect, but a strength of 0·5 per cent. slowed the rate.

Ammonia.—Sufficient ammonia to make Ringer's solution just alkaline to litmus almost stopped ciliary movement; 0·5 per cent. of ammonia (sp. gr. 0·880) in Ringer's solution killed the cilia. Small concentrations of ammonia or its salts produced no acceleration of ciliary movement.

Mercury alanin, 1 in 1000, is lethal to cilia.

Milton, a commercial hypochlorite solution in which 1·08 per cent. of chlorine is available, stopped the movement of infusoria in a concentration of 1 in 1500 to 1 in 2000. 1 in 200 did not stop the cilia of the horse trachea, but 1 in 100 did. The directions given are to use one teaspoonful in 3 pints as a nasal douche = about 1 in 400; this dose appears reasonable.

Mercuric chloride, about 1 in 20,000, stops the cilia of the horse trachea.

Chloramine T. (p-toluene-sodium sulphochloramide).—This slowed, but did not stop the action of the cilia of the horse trachea in the 0·25 per cent. dilution, which is recommended for nasal irrigation.

Monsol.—A solution of 1 in 1000 is recommended as a nasal douche. One part in 2000 was found to slow cilia.

A Popular Prescription for a Nasal Spray—

Thymol	gr. iv.
Camphor	gr. v.
Ol. cinnamoni	ℿ. v.
Menthol	gr. x.
Liq. paraffin	℥ i.

Some drops of this shaken up in a tube of water with infusoria stopped them, but drops standing on top of water in a tube had no effect on infusorial movement. Some of this prescription was put on a piece of horse trachea and left for five minutes; the cilia showed active movement in Ringer's solution.

This prescription appeared to be harmless to cilia.

Carbolic Acid.—A 1 in 600 to 1 in 700 solution almost stops the cilia of the horse trachea; 1 in 1000 slows them.

Glycothymoline in full strength appeared to be harmless to the cilia.

Potassium Permanganate.—It requires a concentration of 1 in 1500 to stop the cilia of the horse trachea; 1 in 10,000 stops the movement of infusoria. Solutions weaker than 1 in 1500 seem very suitable for a nasal douche.

Sanitas.—The cilia move actively in 1 per cent. solution, slowly in 5 per cent. Infusoria appear to be much less sensitive; they were active in 15 per cent., but stopped in 20 per cent. For use as a nasal douche a 25 per cent. solution is recommended; this seems too strong for the cilia.

Hydrogen Peroxide, 3 per cent. Commercial Solution (Acid).—One part of this solution in 5 Ringer made the cilia move slowly; 1 in 3 stopped them. One part in 10 stopped infusoria after a time. A 1 per cent. solution of pure neutral hydrogen peroxide stopped cilia.

Potassium Chloride.—Gray states that an increase of potassium chloride in Ringer's solution accelerates the cilia of invertebrata. The addition of either 20 or 40 c.cm. of 0·2 per cent. potassium chloride to 200 c.cm. of Ringer's solution had no accelerating effect on the cilia of the horse trachea.

Arsenical War-gas Fumes.—A specimen was fumed by heat in a flask and the piece of trachea lowered into the fumes; on withdrawal, after exposure for one minute, the ciliary movement was slow. Sneezing was excited by the slightest whiff from the flask when this was momentarily opened out of doors; one part in some 10 millions of air suffices to irritate the nose. The concentration required to act on nerve-endings in the nose and produce very severe sensory disturbance is far less than that required to damage the cilia.

Bromine Gas, 1 in 5000.—The cilia stopped after exposure to this for 6–7 seconds. Infusoria were also stopped when they were exposed in a drop clinging to a glass rod lowered into the gas.

Anaphylaxis.—Six guinea-pigs were sensitised to horse serum; there was no effect from putting horse serum on the excised trachea of three of these animals, but the other three showed the usual phenomena of anaphylaxis on injection of horse serum.

Diphtheria toxin had no effect on the cilia of the trachea.

Adrenalin, acetyl choline, and histamine added to baths of Ringer in concentration sufficient to act powerfully on the uterus of a guinea-pig had no effect on the cilia of the trachea.

The method described in this paper is one which lends itself readily to the testing of the toxicity of solutions and vapours used on the respiratory membrane.

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JEJUNAL AND GASTRO-JEJUNAL ULCERS.

BY ARTHUR F. HURST, M.D. OXF., F.R.C.P. LOND.,
PHYSICIAN TO GUY'S HOSPITAL;
AND
M. J. STEWART, M.B. GLASG., F.R.C.P. LOND.,
PROFESSOR OF PATHOLOGY IN THE UNIVERSITY OF LEEDS.

II.* *Symptoms and Diagnosis.*

IN about 20 per cent. of cases the gastro-jejunal or jejunal ulcer appears to develop immediately after the operation, and the symptoms caused by the original ulcer before the operation merge into those caused by the new anastomotic ulcer without any interval of complete freedom. In a New Lodge Clinic series of 34 cases 7 had had no relief after the operation; 9 were relieved for a few months only, 12 for between one and two years, and 6 for between two and 12 years. In one of our hospital patients there was an interval of 17 years between the performance of a gastro-jejunostomy and the perforation of a jejunal ulcer; symptoms had been completely absent for the first 14 years, when a new ulcer developed in the duodenum and eventually perforated two years before the perforation of the jejunal ulcer. It is obvious, therefore, that Sherren was wrong when he stated that a patient who had had no symptoms for two years after a gastro-jejunostomy could be regarded as free from the danger of an ulcer.

In a series of 10,300 autopsies at Leeds there were 25 cases of jejunal ulceration and scarring, of which 22 had survived the original operation for periods varying between 9 months and 19 years; 21 of these had had freedom from symptoms for periods ranging from two months to 15 years. Three patients who died 18 days, 22 days, and 35 days respectively after operation were the subjects of acute jejunal ulceration, and in one of these hæmorrhage from the ulcer was the immediate cause of death, but such cases are exceptional.

* Part I. appeared last week.

In many cases the onset of symptoms is the immediate sequel of an indiscretion in diet or the consumption of excess of alcohol. In others it follows a period of worry or over-work, or a "chill" due to exposure to cold and damp. It is uncommon for patients, who have been free from symptoms for a year after the operation, to develop an anastomotic ulcer later if they continue to be careful about their diet and to avoid alcohol and excessive smoking.

The symptoms are similar to those of the original duodenal ulcer and sometimes show a similar periodicity, but the time of onset of the pain is more irregular and is generally earlier after meals, being less completely relieved by food and by sodium bicarbonate. Sometimes, however, it is delayed as long as with the original duodenal ulcer. The pain is almost invariably situated nearly on a level with the umbilicus instead of being higher up in the epigastrium, and it is generally to the left of the middle line, instead of in the centre or right as with the original duodenal ulcer. It is sometimes aggravated by exercise, particularly by twisting or bending; this is very likely to occur in the rare cases in which the ulcer is adherent to the anterior abdominal wall. The patient may also complain of nausea and flatulence, but vomiting is rare. He may so restrict his diet in his effort to prevent the pain that great emaciation results.

Hæmatemesis or melæna may occur without any previous symptoms. In two of the New Lodge Clinic series profuse hæmorrhage took place at intervals with no other symptoms, beginning two years after a gastro-jejunostomy had been performed for a duodenal ulcer. It may be preceded by a short period of indigestion, or it may occur as an incident in patients with chronic indigestion. It appears to be more common with anastomotic ulcers than with gastric and duodenal ulcers; thus in the New Lodge Clinic series of 204 patients with a chronic ulcer there were 35 (17 per cent.) with a gastro-jejunal or jejunal ulcer; but of 51 who gave a history of severe hæmorrhage 16 (32 per cent.) had an anastomotic ulcer. Altogether hæmorrhage occurred in 21 out of 43 cases of anastomotic ulcer. In two instances hæmatemesis occurred alone, in 14 melæna alone, and in 5 both hæmatemesis and melæna. In 7 of the 21 hæmorrhage had also occurred from the original duodenal ulcer, but in every instance the number and severity of the hæmorrhages were greater after the operation than before. In six additional cases hæmorrhage had occurred before the operation, but not afterwards from the anastomotic ulcer.

Severe anæmia may result from repeated hæmorrhage. In spite of its frequent severity the hæmorrhage did not prove fatal in any of the New Lodge Clinic series of cases, and in only one of the 22 autopsy cases in Leeds was hæmorrhage the immediate cause of death. In a case at Guy's Hospital medical treatment failed to arrest the hæmorrhage, which was not associated with any other symptoms; operation was therefore advised, but as no ulcer could be seen or felt, a jejunostomy was performed. The hæmorrhage ceased, but unfortunately the jejunum became detached from the abdominal wall and the patient died from peritonitis. At the autopsy no ulcer was found. Presumably the hæmorrhage had taken place from an acute jejunal ulcer, which had healed in the interval; this would also account for the absence of pain. In two of the Leeds cases, both jejunal, one of them with a jejuno-colic fistula, considerable hæmorrhage occurred in the last few weeks or months of life, and in another case death was due to hæmorrhage from a chronic gastric ulcer nine months after the gastro-jejunostomy had been undone. A fractional test-meal only rarely shows the presence of blood in one or more specimens, but in 84 per cent. of the New Lodge Clinic cases occult blood was found in the stools.

Local tenderness is frequently present over the ulcer and it is often associated with muscular rigidity. Occasionally a definite swelling or induration is felt, due to plastic peritonitis with or without adhesions to the abdominal wall.

Table II. shows the amount of free acid found in the fractional test-meals. No less than 34 per cent. show hyperchlorhydria and an additional 40 per cent. a high normal in spite of the gastro-jejunostomy.

TABLE II.—*Results of Fractional Test-meals in 38 Cases of Anastomotic Ulcer at New Lodge Clinic.* (Evans Jones.)

Acidity (Bell's classification).	Number and percentage.
Hyperchlorhydria	13 (34)
High normal	15 (40)
Normal	5 (13)
Low normal	2 (5)
Hypochlorhydria	1 (3)
Achlorhydria	2 (5)

Porges and others have shown that the achlorhydria occasionally found after a test breakfast in patients with anastomotic ulcers is only apparent, as free acid is always present if the gastric contents are examined after a larger meal.

In one case a "high normal" curve was obtained in a patient on whom "almost complete gastrectomy" had been performed for a gastric and a jejunal ulcer four years after the original gastro-jejunostomy and four years before admission to the Clinic.

Bile was present in every fraction in 45 per cent. of cases and in some fractions in an additional 38 per cent. In the remaining 17 per cent. none was present, presumably owing to the anatomical conditions at the stoma causing all the contents of the proximal limb of the jejunum to pass directly into the distal limb without gaining access to the stomach; in some of these cases bile appeared in the gastric contents after medical treatment had caused the ulcer to heal, the obstruction apparently having been due to inflammatory swelling round the ulcer (Chart VI.).

With the X rays an opaque meal can be seen leaving via the stoma. Palpation under the screen then shows that the tenderness is strictly localised to the stoma or to some point in the first 4 inches of the efferent limb of the jejunum, this being generally the only clinical means by which gastro-jejunal and jejunal ulcers can be distinguished from each other. In most cases the stomach empties rapidly, as it does after an ordinary successful gastro-jejunostomy. In chronic cases, however, the stoma may become obstructed; a fractional test-meal and the X rays then show delay in evacuation (Charts I. and II.), and the latter may reveal exaggerated peristalsis and dilatation of the stomach if the pylorus is also obstructed.

Occasionally some deformity in the region of the stoma can be recognised with the X rays, but the majority of anastomotic ulcers are very difficult to reveal radiographically.

It is very important to ascertain whether the pylorus is still patent—if necessary, by examining the patient whilst lying on his right side, as the possibility of undoing the gastro-jejunostomy depends upon this.

Diagnosis.—When symptoms recur after gastro-jejunostomy the possibility of jejunal ulceration should always be considered. It has to be distinguished from persistence or recurrence of duodenal or gastric ulcer, chronic appendicitis or gall-bladder disease overlooked at the time of the first operation or possibly developing at a later date, and, very rarely, carcinoma supervening upon an unhealed gastric ulcer or originating at the stoma.

When the X rays show that all the gastric contents pass out by the stoma and that nothing reaches the duodenum by way of the pylorus, it can be confidently assumed that the symptoms are not due to recurrence or persistence of ulceration of the duodenum. The recurrence or persistence of a gastric or duodenal ulcer leads to the same symptoms as before the operation, the position and time of occurrence of the pain being unaltered. As already pointed out, the pain and tenderness in gastro-jejunal and jejunal ulcer are generally to the left of

the middle line and always lower down than in duodenal ulcer. Moreover, the pain is more capricious and intractable. The pain never begins immediately after meals if a duodenal ulcer is unhealed, and a considerable proportion of the food is seen with the X rays to pass through the pylorus.

Fullness and discomfort to the left of the umbilicus immediately after meals, often associated with diarrhœa, are not uncommon after gastro-jejunostomy, but they are not due to the presence of ulceration. Tenderness over the stoma or some point in the first few inches of the distal loop of jejunum, and, more conclusively, the occurrence of obvious hæmorrhage or the presence of occult blood in the stools, point to the presence of an ulcer.

III. *Complications.*

Perforation.—This is the most serious and one of the most frequent of the complications of jejunal ulcer. In Lieblein's (1915) collected series the incidence of perforation was 23 per cent. (30 out of 129 cases), and in Wright's (1918–19) series 19 per cent. (32 out of 165 cases). These figures, however, exaggerate the frequency of perforation, as they only include cases coming to operation and exclude the comparatively large number without perforation which respond more or less satisfactorily to medical treatment.

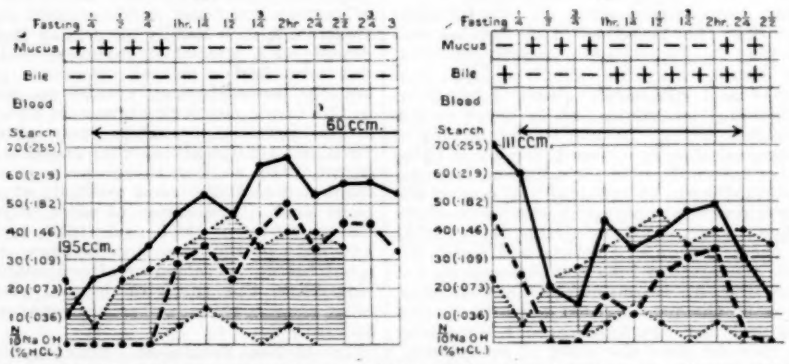
In the majority of cases it is the true jejunal and not the gastro-jejunal ulcer which perforates. Thus of 38 perforated ulcers collected by Massie (1924), 8 were at the anastomosis and 30 in the jejunum.

There are two chief varieties of perforation: (*a*) into the peritoneal sac, and (*b*) into the transverse colon after adhesions have formed with the base of the ulcer. Some indication of the comparative frequency is given by our post-mortem findings. In the Leeds series of 22 cases a second jejunal ulcer occurred in four, and in one of these a third. This gives a total of 27 ulcers, seven of which, all of them jejunal, perforated into the peritoneum and seven, including six jejunal, into the transverse colon. One case is common to both groups, perforation into the peritoneum taking place six weeks after the apparent date of formation of the jejuno-colic fistula. In another case two successive jejunal ulcers perforated, an interval of four years and four months elapsing. In the great majority the perforation occurred without appreciable symptomatic warning. Of the seven intraperitoneal perforations, five apparently occurred without previous symptoms; in one there had been symptoms suggestive of jejunal ulcer for six years with tarry stools for five weeks, and in one there had been symptoms for eight months.

The interval between the date of the original operation and the occurrence of free perforation into the peritoneum varied in the seven cases from nine months to ten years, with an average of five years. When jejunal ulceration follows anterior gastro-jejunostomy there is a considerable likelihood of the ulcer becoming adherent to the anterior abdominal wall, and in very rare instances it may perforate in this situation, forming an external fistula (Paterson, 1909 (*a*)).

Jejuno-colic, gastro-jejuno-colic, and gastro-colic fistula.—In about 10 per cent. of cases of gastro-jejunal and jejunal ulcers coming to operation and in 2 out of the 43 New Lodge Clinic cases, perforation into the colon with the production of a fistula has taken place. As a rule, the fistula is truly jejuno-colic, although its jejunal termination is usually close to the anastomotic line. Occasionally it is gastro-colic or gastro-jejuno-colic when there is free and direct communication between all three viscera. In a case reported by Hartmann (1926) two separate fistulæ, jejuno-colic and gastro-jejuno-colic, were present, and in a Guy's case described by Brook (1928) there were two distinct gastro-colic fistulæ. Sometimes there is direct communication without the intervention of any appreciable fistulous track, much in the same way that the stomach and jejunum communicate after gastro-jejunostomy. In others the communication is small and even valve-like, so that the symptoms are intermittent. These two results are probably brought about in different ways. In the first the floor of the jejunal ulcer is in close contact with the wall of the colon from the outset; in the second these structures are some distance apart and it is by involvement first of the mesocolon and its gradual thickening and contraction that the two are sufficiently approximated to allow the fistulous communication to take place. The formation of the fistula is usually followed by the rapid healing of the jejunal ulcer, and the pain arising therefrom may disappear. On the other hand, gastric analysis may still show a fairly high content of free HCl, and the possibility of further peptic ulceration in the colon should be borne in mind. It is by no means uncommon for the transverse colon to become stenosed at a point 1 or 2 cm. below the opening of the fistula; it is a reasonable supposition that this also is the result of peptic ulceration and healing. One of the Leeds cases showed it.

CHART VI.



Male, aged 36, had gastro-jejunostomy in 1921 shortly after hæmatemesis without other symptoms. Gastro-jejunal ulcer symptoms developed at once and continued till admission to New Lodge Clinic, Jan. 1st, 1926. Much occult blood. Test-meal (A) showed 195 c.cm. resting juice and 60 c.cm. starch-containing acid fluid at three hours; no bile. Treatment with diet, atropine, and evacuation every night resulted in disappearance of symptoms and occult blood. Test-meal (B) on Feb. 4th, 1926, only 111 c.cm. resting juice and evacuation complete in two and a half hours, and bile *now enters stomach*, as œdema and congestion causing obstruction round ulcer causing obstruction to stoma now disappeared.

The interval which elapsed between the original gastro-jejunostomy and the first appearance of the signs and symptoms of fistula varied in our cases between 2½ months and 20 years. The average interval in 19 cases at the Mayo Clinic was five years (Verbrugge, 1925), and in 11 Leeds, Guy's, and New Lodge Clinic cases seven years. All the cases so far recorded have been in men. In the Mayo Clinic series the original operation had been performed for duodenal ulcer in 17 cases and for gastric ulcer in 2. In the Guy's and New Lodge series of 9 cases, 7 followed an operation for duodenal ulcer, 1 "pyloric ulcer," and 1 gastric ulcer (Brook). In the Leeds series all the 7 cases followed an operation for duodenal ulcer.

The onset is generally rapid, but in some cases premonitory symptoms of jejunal ulcer have existed

for some time. The symptoms vary a good deal in different cases, depending on the size and character of the fistula and its exact situation. In gastro-colic and gastro-jejuno-colic fistula the full syndrome of violent diarrhœa with the presence of undigested food in the stools, fæcal vomiting, the belching of foul-smelling gases, and rapid emaciation is often met with. In jejuno-colic fistula diarrhœa, more or less severe and often intermittent, is generally the chief symptom, but in a New Lodge Clinic case there was severe constipation, the symptoms closely simulating those of carcinoma of the colon. Vomiting, sometimes fæculent, also tends to be intermittent, and to come on at times when the diarrhœa is worst. This is dependent, of course, on the readier passage of fluid fæces through a narrow fistula, and inquiry will usually elicit the fact that the patient feels at his best when the bowels are constipated. The belching of gas with a fæcal odour is a very important diagnostic sign, since it may be present in the absence of vomiting, and occurs in no other condition except pyloric cancer. Pain, when present, is colicky in type, and differs, therefore, from the more continuous pain of a gastro-jejunal or jejunal ulcer. The degree of wasting depends on the severity of the other symptoms and is likely to be extreme in the later stages.

A radiological examination after an opaque meal or enema confirms the presence of a fistula, and fæcal material may be found in the gastric contents.

Jejuno-colic fistula may be survived for considerable periods and ultimately prove fatal from sheer exhaustion and starvation, as in three of the cases in our autopsy series. In one, the symptoms of fistula had been constantly present for over three years, in another intermittently for a like period, and in a third continually for 15 months. In one of the remaining four a remedial operation was successfully carried out after a year, death occurring ten months later. In one the symptoms of fistula had lasted for six weeks when perforation into the peritoneum led to a fatal issue (Fig. 3), in one, after eight months, a stercoral ulcer in the pelvic colon perforated, and in the seventh and last death followed a detaching operation four months after the onset of symptoms.

There is no doubt that post-operative jejuno-colic fistula is increasing in frequency, presumably pari passu after a certain interval with the number of cases of duodenal ulcer treated by gastro-jejunostomy. Judd (1921) met with the complication six times in his series of 101 cases of jejunal ulcer, but four years later (Verbrugge, 1925) the number treated at the Mayo Clinic had risen to 21. Bolton and Trotter in 1920 were able to collect 31 cases in all, including four of their own. In 1925 Verbrugge collected 95, including the 21 from the Mayo Clinic. All the 7 cases in the Leeds post-mortem series have occurred in the last three years, 1 in 1925, 2 in 1926, and 4 in 1927. Of the 9 cases in the Guy's and New Lodge series 1 occurred in 1915, 1 in 1922, 3 in 1926, 3 in 1927, and 1 in 1928 (Brook). No single case was met with in the post-mortem room at Leeds between the years 1910 and 1924 inclusive, although several cases were successfully treated in the wards during this period.

IV. *Prophylaxis and Treatment.*

If gastro-jejunostomy was only performed when there is a visible and palpable ulcer causing obstruction of the pylorus or duodenum; if before the operation every possible source of infection in the mouth and pharynx was removed; if at the operation any associated disease of the appendix or gall-bladder was dealt with; if after the operation the patient was given adequate instructions with regard to diet and told to take additional feeds between meals; and if moderation in smoking and the taking of olive oil before meals were also enjoined, then the chances that a gastro-jejunal or jejunal ulcer might develop would be reduced to a minimum. Under such conditions these complications would rarely, if ever, arise in the absence of some gross error in technique.

Evans Jones has pointed out the remarkable fact that among our New Lodge Clinic series of 34 cases of jejunal and gastro-jejunal ulcer a complete investigation with the X rays, test-meal, and examination of the stools for occult blood has been carried out in no single case before the original gastro-jejunostomy was performed. Even a radiological examination had only been made in seven, or 20 per cent., of the cases. Only six, or 17 per cent., had previously been given any medical treatment worthy of the name, and in none of these had it been sufficiently prolonged to give the ulcer a real chance of healing. Pyorrhœa alveolaris, apical dental infection, or both, was present in 80 per cent. of case, and in some well-marked infection of the tonsils or nasal sinuses was also found. In very few cases had any attempt been made to deal with these foci of infection before the operation. Lastly, none of the patients had been given precise instructions with regard to diet and the other precautions required to prevent a recurrence of ulceration. It must be remembered that all the patients were private cases, operated on by well-known and experienced surgeons, who could have insisted upon the conditions both before and after operation being satisfactory.

With no adequate preliminary examination or treatment to decide whether an operation was really required, with insufficient attention to the removal of septic foci, and with grossly inadequate after-treatment, it is hardly surprising that these patients developed a jejunal or gastro-jejunal ulcer, and that five who had a second operation performed under equally unsatisfactory conditions before they came to the Clinic developed a second anastomotic ulcer.

The primary operation was performed between 1915 and 1925 in all but four cases, and in no instance before 1910, so that there can be no question of old-fashioned and discarded methods of operation having been used. This series of cases seen in New Lodge Clinic between 1921 and 1928 received no more adequate preliminary investigation or medical treatment before operation or after-treatment after operation than the cases of jejunal and gastro-jejunal ulcer seen in private practice between 1908 and 1915 and in 1920.

(*a*) *Medical Treatment.*—Strict medical treatment on the lines we have laid down elsewhere for gastric and duodenal ulcer should be very thoroughly tried, and, if successful, the patient should be given definite instructions with regard to diet and the other necessary precautions in order to avoid any chance of recurrence. One patient, who had remained well for six years after medical treatment had led to the healing of a jejunal ulcer, which had been present when he was first seen four years after a gastro-jejunostomy for duodenal ulcer, had a relapse with pain and severe hæmorrhage when he decided on his own responsibility that he would no longer follow the rules laid down for him with regard to diet, alcohol, and tobacco. The new jejunal ulcer also healed under prolonged medical treatment.

It is extremely important to eradicate every possible source of infection in the mouth, pharynx, or elsewhere. In the early stages medical treatment often succeeds, and it can sometimes avail even when definite obstruction of the stoma is present owing to inflammatory swelling and œdema round a gastro-jejunal ulcer. This was well seen in the case from which the test-meals shown in Chart V. were obtained; the delayed evacuation present when the ulcer was active disappeared under treatment, and bile, though absent from all fractions at first, entered the stomach through the stoma when the ulcer had healed. When, however, severe obstruction is present, and whenever prolonged medical treatment fails to give relief, resort should be had to surgery.

(*b*) *Surgical Treatment.*—We feel convinced that the best as well as the simplest operation for gastro-jejunal and jejunal ulcer is local excision, together with restoration of the stomach and jejunum to their normal anatomy. As the duodenal ulcer has almost invariably healed, the gastro-jejunostomy has done its work, and there is no object in performing another, as the usual precautions taken to avoid the recurrence

of a duodenal ulcer after medical treatment should suffice to keep the patient free from danger of a new ulcer developing in the duodenum. On the other hand, it is not at all uncommon for a second gastro-jejunal or jejunal ulcer to develop if a second gastro-jejunostomy is performed. A second jejunal ulcer is likely to be much more difficult to cure medically than a new duodenal ulcer in the unlikely event of one forming if a second short-circuiting operation is not performed. A gastro-duodenostomy is no better in this respect than a second gastro-jejunostomy. Only in the rare cases in which a jejunal ulcer develops after a gastro-jejunostomy performed for pyloric obstruction is it necessary to make a new gastro-jejunostomy after the anastomotic ulcer has been excised.

The much more difficult and dangerous operation of partial gastrectomy is only justifiable under very exceptional conditions. The mortality in cases of jejunal ulcer in Eiselsberg's clinic was no less than 25 per cent. Klein (1927) has shown that in only two out of six cases was the operation followed by achlorhydria, so that the risk of a new jejunal ulcer or gastric ulcer developing remains in 66 per cent. of cases. Birgfeld in 1925 collected 15 cases from the German literature, in which a new anastomotic ulcer had developed after partial gastrectomy performed for a jejunal ulcer—the result in most instances of a gastro-jejunostomy performed for a duodenal ulcer. Finsterer, however, believes that if at least three-quarters of the stomach are removed recurrence never occurs, as complete achlorhydria results; his mortality is only 9 per cent. in 76 cases.

The treatment of gastro-jejuno-colic fistula is, of course, always surgical. But the operation is likely to be very difficult, and the immediate mortality in 63 cases collected by Loewy was 27 per cent., though in the nine Guy's and New Lodge cases there were no deaths. In addition to this, recurrence of ulceration occurred in 11 per cent. of the cases (Loewy).

Results of Treatment.—In seven of the New Lodge Clinic series of 35 cases a thorough investigation showed that medical treatment was unlikely to be of any use, and an operation was advised after all septic foci had been eradicated. In each case the ulcer was excised and the normal anatomy restored by undoing the gastro-jejunostomy, as the X rays had shown that the pylorus was patent—a fact confirmed at the time of the operation. All the patients were completely relieved for a time, but two subsequently developed symptoms of ulceration after a dietetic indiscretion; in both cases the ulcer healed after further medical treatment. In one additional case, in which a gastro-duodenostomy had been performed at the same time, though not on my advice, a gastric ulcer developed six months later; after two and a half years of chronic indigestion it perforated, death occurring a few days after operation.

In five other cases it was expected that an operation would eventually be necessary, but a preliminary trial of medical treatment, together with removal of infective foci, was advised. Two of these improved so much that no operation proved necessary. In two cases, as no improvement occurred, the ulcer was excised and the normal anatomy restored; one of these remained well, but the other has had a further hæmatemesis following a dietetic indiscretion. The third had partial duodeno-gastrectomy performed, but his later history has not been ascertained, as he went abroad soon afterwards.

Of the 25 cases treated medically 13 were more or less completely relieved, and seven had further attacks of melæna or hæmatemesis with good health in the intervals. All but one of them had had hæmorrhages before they came to the Clinic. One patient, who had hæmorrhages at frequent intervals before admission and had undergone two operations since the original gastro-jejunostomy, had one hæmorrhage after a big dinner at which he drank a good deal of alcohol a few months after leaving the Clinic, but in the three and a half years which have elapsed since then he has remained free from symptoms. Only one patient gained no benefit; he should therefore undergo a second operation. In one additional case the digestive symptoms disappeared under medical treatment, but the patient died from Addison's disease, from which he was suffering at the time he was in the Clinic in addition to having a jejunal ulcer. No recent report has been obtained from the remaining three cases.

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REGIONAL ANÆSTHESIA AND INNERVATION OF THE TEETH.

BY D. STEWART, M.Sc. MANCH., M.R.C.S. ENG.,
LECTURER IN ANATOMY, UNIVERSITY OF MANCHESTER;
AND
S. L. WILSON, L.D.S. R.C.S.I.,
HON. ASSISTANT DENTAL SURGEON, VICTORIA DENTAL HOSPITAL, MANCHESTER.

ORIGINALLY cocaine was only injected around the tooth to be operated upon, and its use was practically confined to extractions. With the introduction of regional anæsthesia, or the application of the drug to one of the main nerve trunks instead of to their terminal fibres, the scope of local anæsthesia was greatly enlarged. It was now practicable with a single injection to obtain a considerably larger area of anæsthesia than had been possible under the old technique, and as the injection was made into looser tissues it was much less disagreeable to the patient. The substitution of novocaine for cocaine was another distinct advance, as it abolished many undesirable sequelæ. This improvement in the technique of local anæsthesia has been the cause of its increased use by the dental surgeon, who now employs it for many conservative operations, particularly the excavation of carious cavities. One apparently insurmountable difficulty has been, however, that in many cases the dentine is not completely analgesic or the pulp is acutely painful. Of the many references, we quote a few dealing with the lower teeth.

F. St. J. Steadman, in his excellent book on the subject,[4] discussing injections into the inferior dental nerve, says:—

"A curious phenomenon occasionally met is that the pulps of the molars are too sensitive to extirpate after a

mandible injection, although the teeth may be painlessly extracted. No satisfactory explanation has been offered."

He also states that an injection into the inferior dental nerve is only effective for operations as far forward as the first bicuspid tooth. This is, he says, because the nerve of the opposite side sends fibres across the middle line as far as the region of the canine. H. M. Seldin [3] has pointed out that, although judged by numbness of the lip and tongue, the tooth may appear to be perfectly anæsthetised, yet the dentine and pulp may prove sensitive. He suggests that the sympathetic nerves may carry sensory impulses, and as they run along the blood-vessels they may escape the anæsthetic. There is at least one grave objection to this explanation in the case of the inferior dental nerve, for the artery lies so close to the nerve that it would appear to be impossible for the anæsthetic to act on one without affecting the other. F. L. Platt [2] has seen cases of regional anæsthesia in both jaws, in which anæsthesia was apparently profound in all the superficial tissues, yet no dental operation, other than extraction, could be performed. R. Bragg [1] states: "I find that conservative cases do fail, even when academically perfect and there is perfect bone anæsthesia."

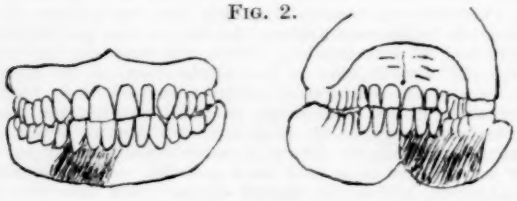
FIG. 1.

Problem of the Sensitive Pulp.

It will be seen that an apparently successful anæsthesia of the dental nerve is apt to give disappointing results. The tooth may be extracted without any trouble, but it may be impossible to work on the dentine, or the pulp may still be acutely sensitive.

In operations on the lower jaw, where the inferior dental had been apparently successfully anæsthetised, we found, like our predecessors, that we were usually able to excavate the dentine without any inconvenience to the patient, but the pulp was generally painful, but less so than without an anæsthetic. Frequently it was not painful as long as no stimuli

FIG. 2.

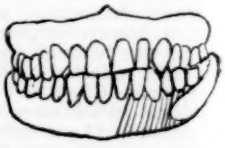


A B

were applied, and even with certain forms of stimuli, such as heat, cold, or pressure with cotton-wool, no reaction was obtained. Any attempt to pass a sharp broach into the pulp chamber brought on severe pain. Whether the diminished sensibility was due to some dissociation of sensations, or merely to a diminution of the power of reaction of the pulp, we are not prepared to say.

There appeared to be two solutions of the problem: either the technique for injecting the anæsthetic was faulty and thus gave varying results, or the nerve-supply to the pulps of the teeth must come from other sources than the dental nerves. In the earlier stages of this research experiments were performed on the teeth of both jaws, but after a short time they were limited to the lower. The reasons for this were two: in the first place, the nerve-supply of the lower teeth is relatively simple, as there is only one dental nerve on each side; secondly, the lower dental nerves are much more accessible than the upper. We employed the usual standard technique for injections of the inferior dental nerve; 1·5 c.cm. of solution were deposited between the internal pterygoid muscle and the ramus of the mandible, at the point where the nerve enters the bone. Generally, the lingual nerve became anæsthetised simultaneously, but if this had not occurred, a further injection of 0·5 c.cm. was deposited in the lingual nerve, the needle entering the tissue on the inner aspect of the ramus at the level of the occlusal surfaces of the lower teeth. When the long buccal nerve required blocking, a further injection was made of 0·5 to 1 c.cm. in the sulcus midway between the cheek and the bone at the level of the roots of the molar, thus catching the nerve as it left the cheek. The success of this technique was controlled by an examination of the sensibility of the skin of the face and of the mucous membrane of the mouth. This was considered to be of the utmost importance, as it gave precise comparative information of the amount of anæsthesia, and showed exactly which nerves had been injected. On the skin the areas insensitive to light touch and pain were mapped out. For testing light touch a few strands of cotton-wool were used, and for pain the prick of a needle. In the mouth, however, it was very difficult to distinguish the areas insensitive to light touch on account of the shape of the cavity and the dampness of the mucous membrane; sensitiveness to pain only, therefore, was tested.

FIG. 3.



Case 23 (Figs. 1 and 2) provided a very typical example of the anæsthetic areas which are found after an injection into the inferior dental nerve. The two areas marked on the skin of the face by a continuous and a dotted line represent the parts insensitive to prick and light touch respectively. These areas extend from the edge of the lips above to a varying distance below, although they do not generally extend very far on to the submaxillary region. Anteriorly they approach the mid-line, although in most cases they do not quite reach it; posteriorly, they terminate near the angle of the mouth. The mucous membrane of the mouth, which becomes continuous with the skin above, is also insensitive. The two areas for touch and prick do not necessarily correspond, though in a certain number of cases they do. Of 15 cases in which we have the records of these areas, they were coincident in six. Fig. 2 is a standard diagram which we have used for plotting areas within the mouth: (*a*) is for the buccal side of the mouth, while (*b*) is for the lingual side, the shaded area indicating the part insensitive to prick. In this figure, which is also plotted from Case 23, there is an insensitive area extending from the canine tooth to the middle of the central incisor of the opposite side. This represents the area supplied by the inferior dental nerve alone; at the edge of the lips it becomes continuous with the inferior dental area of the skin. In front the area crosses to the opposite side of the body and invades the region which should be occupied by the nerve of that side. This has been seen in quite a number of patients. Of 19 cases, 8 overlapped the middle line, 3 exactly reached it, and 8 did not extend as far. The actual distance to which the area extends over the mid-line varies, but we have not seen it go beyond the lateral incisor. Of 18 patients, only 4 showed this phenomenon in the face areas. Either of the following hypotheses would explain it: the mid-line of the body may not correspond exactly with the mid-line for the nerve, or impulses other than pain may have elicited a response, so that the condition could be explained by simple dissociation and overlap.

Behind the inferior dental area there is a portion of the buccal aspect of the gum which is not anæsthetised; this is supplied by the long buccal nerve, and it is the distribution of this nerve which is responsible for the variation in the posterior limits of that area of the mucous membrane which is solely supplied by the inferior dental nerve. In Fig. 2A the area of the long buccal nerve extends as far forward as the space between the first bicuspid and the canine. The extent of the gum supplied by this nerve varies, however, in different individuals; it may extend as far forward as the middle of the canine, or only to the anterior border of the second molar. We believe that its distribution in the gum varies as in the superficial tissues, and may often run farther forward. Another arrangement quite commonly found is shown in Fig. 3, where the area for the inferior dental nerve extends backward for a varying length in its upper part and separates the long buccal area from the gingival margins of the teeth.

FIG. 4.

Fig. 2 B shows the distribution of the lingual nerve to the inner side of the gum. The anterior limit of this area also varies; quite frequently it ends at the mid-line of the mouth, but often further back; in one case it only came as far forward as the canine. This condition can, of course, be explained by overlapping from the opposite side. We have, once or twice, seen the area solely supplied by the lingual nerve trespass over to the opposite side of the mouth.

By mapping out these areas we could find out exactly which nerves had been affected by the anæsthetic, and could also get a very fair idea of its efficiency.

The next problem was, how sensations pass to the brain when the inferior dental nerve has been effectively anæsthetised. Although the long buccal nerve is said only to supply the outer alveolar plate and the lingual nerve the inner plate, it seemed possible that either or both of these nerves might send fibres to the teeth. Starkie and Stewart, in some unpublished work, have shown that the plexus in the mandible is far more complicated than is generally supposed, as it forms a network which ramifies over a large area; this plexus might receive twigs from the branches which supply the alveolar plates. In two of our cases, in which the pulps had been successfully removed, the area of the gum supplied by the long buccal nerve had been anæsthetised. In these two, as in practically all our patients, the lingual nerve had been anæsthetised along with the inferior dental.

We now chose a suitable case for further investigation. This was a youth, aged 17½ years, who had a large coronal distal cavity in his second left bicuspid tooth. An injection was made into the inferior dental nerve and after an interval of three minutes the patient said that his lip had begun to tingle. Excavation of the cavity was now commenced, and the patient complained of slight pain. After the decay had been removed, the pulp was found to be exposed and the upper wall of the chamber was removed. The patient still stated that the pain was only slight and not like that of an exposed nerve (of which he had had several). The long buccal nerve was now injected, and very shortly afterwards the pain ceased. The pulp was removed without any discomfort. Before the long buccal was injected, the normal area of skin supplied by the inferior dental nerve was analgesic. After the buccal injection most of the cheek was anæsthetic. It is to be noted that the lingual nerve was injected along with the inferior dental.

The second case which we desire to quote is that of an adult female who had a distal cavity in the left lower canine. The patient complained of intermittent pain. An injection was made into the inferior dental nerve, and the lingual nerve was successfully avoided. Tingling of the lip was felt five minutes after the injection. As the patient was very nervous and showed signs of collapse examination was postponed. There was no pain until the pulp chamber had been opened out, when the patient had acute pain, which ceased when manipulations were stopped. There was no pain when simple pressure was applied to the pulp. The patient had now become calmer and the areas of anæsthesia were marked out (Figs. 4 and 5). It will be observed that only the inferior dental has been anæsthetised, and that the long buccal area extends as far forward as the centre of the canine. The long buccal nerve was now injected, but the pulp was still sensitive. The lingual was injected and all sensibility in the pulp disappeared. A barbed broach was passed right into the pulp and the tissue was removed without any trouble.

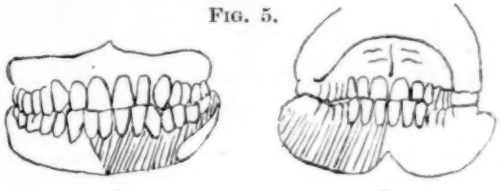
This case has several interesting features. In the first place, it shows that the pulp may be supplied by both the lingual and long buccal nerves. Secondly, it suggests that the usual explanation of the failure to anæsthetise the pulp in the canine—namely, overlap from the opposite side—may not be the only one. The cause may be additional nerve-supply from the other nerves of the jaw. This agrees with our own observations and with those of Starkie and Stewart, that overlap does not normally extend further than the lateral incisor. The fact that the long buccal nerve is sometimes anæsthetised along with the inferior dental nerve is probably due to the occasional incorporation of fibres of the long buccal nerve with the inferior dental as far as the inferior dental canal.

On account of the limited time at our disposal for this work and a certain amount of difficulty in obtaining the right type of patient, the number of our cases is at present small, and therefore our results are to a certain extent provisional. Up to the present we have eight cases in which the residual sensibility after injection of the inferior dental nerve was completely removed when the lingual and long buccal nerves were injected, and three cases in which the three nerves were simultaneously anæsthetised by the injection and the pulp removed painlessly. We intend to dissect the long buccal and lingual nerves to see if their branches can be traced into the dental plexus.

Summary.

This paper contains an account of an investigation into the causes of the residual sensation found in the pulps of teeth after injection of the inferior dental nerve. Evidence is brought forward to show that this is due to the supply to the pulp of fibres from the long buccal and the lingual nerves, and that if they are effectively blocked the residual pain will disappear.

FIG. 5.



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We acknowledge indebtedness to the Dean and the Board of the Victoria Dental Hospital, Manchester, for facilities for carrying out this investigation. To Prof. J. S. B. Stopford our thanks are due for his encouragement and helpful criticism. We are indebted to Mrs. Stewart for her assistance in preparing this paper for the press.

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Clinical and Laboratory Notes.

A NOTE ON STRANGULATED INCISIONAL HERNIA.

By Hamilton Bailey, F.R.C.S. Eng.,
Gillson Scholar, Society of Apothecaries; Surgeon, Dudley Road Hospital, Birmingham.

Incarceration of an incisional hernia is a dangerous and inaccurate diagnosis. Small intestine is nearly always a constituent of the sac contents, and, probably because the intestine has been entangled in adhesions for a considerable time, the symptoms of acute obstruction are to some extent masked. These patients appear to tolerate the toxæmia of intestinal obstruction in a remarkable manner, whilst gangrene proceeds apace in the sac.

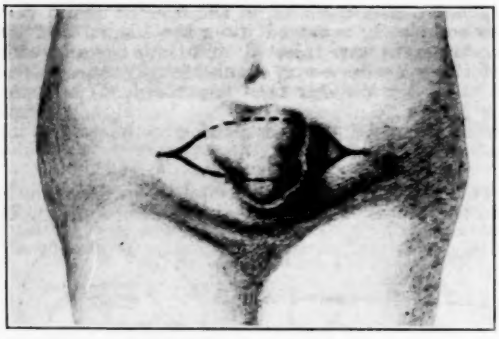
A woman of 58 had a strangulated incisional hernia; 35 years previously Lawson Tait had performed ovariotomy. Five days before I saw her the hernia had become more prominent and painful. During the whole of the five days she had vomited but once, and that was at the commencement of the attack. Her pulse-rate was 80, and the temperature 99° F. On examination the skin over the hernia was acutely inflamed and surmounted by a gangrenous patch. Around the hernia there was commencing spreading cellulitis of the abdominal wall.

At operation the sac was found to contain a coil of black, perforated intestine. The gut was resected, and end-to-end anastomosis performed. A large part of the abdominal wall sloughed.

She died two months later.

Other, almost as striking, examples of the masking of the signs of obstruction have been noted in this

Fig. 1.



Incisional hernia, Type 1.

series of cases of strangulated incisional hernia. As a general rule, it may be said that conservatism in these cases usually spells disaster. The mid-line lower abdominal incision certainly appears to be the most potent cause of incisional herniæ which strangulate (see table).

No.	Sex and age.	Previous operation.	Contents of sac.	Method used.	Result.
1	F., 52	Gynæcological.	S.O.	1	R.
2	F., 52	"	S.*	2	D.
3	F., 77	Gall-stones.	S.O.	2	R.
4	F., 69	Gynæcological.	S.	2	R.
5	M., 22	Appendicectomy (Battle).	S.O.	1†	R.
6	F., 46	Gynæcological.	O.	1	R.
7	F., 58	"	S.*	1	D.
8	F., 50	"	S.O.	1	R.
9	F., 56	"	S.	1	D.

S. = small intestine. O. = omentum. R. = recovered. D. = died.
* Gangrenous. † Vertical.
Methods 1 and 2 refer to types described in text.

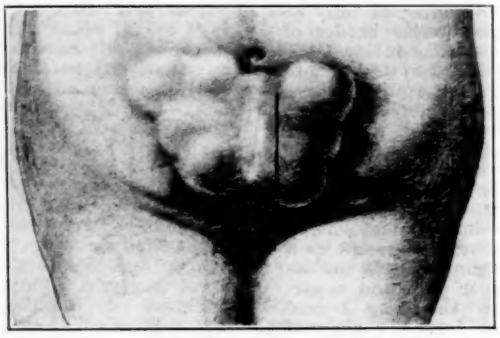
Operative Treatment.

The table gives an analysis of the cases of strangulated incisional hernia upon which I have operated. The large preponderance of cases in which the original operation had been a gynæcological one is striking.

For purposes of operative treatment incisional herniæ may be usefully divided into two classes: 1. Those with a reasonably defined neck. 2. Large multilocular.

Type 1 may be considered as similar to an umbilical hernia. The transverse elliptical incision around the hernia may be used with advantage. After the sac has been removed, and the obstruction relieved, the abdominal wall can be repaired in a manner similar to that of Mayo's operation, to which the end-results are comparable.

Fig. 2.



Incisional hernia, Type 2.

Type 2.—On careful palpation it will usually be found that one loculus is more tense and tender than the remainder. A vertical incision over this loculus should be made with great care, for, as often as not, after the scarred skin has been incised it will be found that only a veil-like sac separates the scalpel from a tense loop of intestine. In this type of case one must be content to relieve the obstruction, making no attempt to repair the hernia. In certain cases repair of the abdominal wall may be undertaken at a later date.

GANGRENOUS APPENDICITIS IN A NONAGENARIAN.

By J. Allan Berry, M.S. Durh., F.R.C.S. Edin.,
Medical Superintendent, Napier Hospital, New Zealand.

Acute appendicitis in the aged is not common, although cases occurring at the ages of 75 years [1] and at 80 years [2] have been recorded. The following account of acute appendicitis in a Crimean veteran who fought on the Jeanne d'Arc at Sebastopol constitutes a record as far as I can learn. His naval papers showed that he would be 90 years of age in May, 1927.

The patient was admitted to the Napier Hospital from the Old Peoples Home, at Park Island, on Dec. 7th, 1926, suffering from acute abdominal pain which he himself diagnosed as being due to appendicitis. He stated that 20 hours previously, while straining at stool, he "felt something drop" in his right iliac fossa and was seized with acute abdominal pain. This pain had persisted without cessation and had localised to the right iliac fossa. He had had difficulty in passing urine for the same length of time. On palpation a tender mass was felt in the right iliac fossa, and on rectal examination there was tenderness on the right side. Examination of his urine showed a small amount of albumin, some blood, and a few hyaline casts. He had a leucocytosis of 15,400. His temperature was 98·6° F., the pulse-rate 88, and the respirations 20.

[1] Forster, F. C.: Brit. Med. Jour., 1925, ii., 479.
[2] Metcalfe, B. B.: Ibid., p. 584.

A muscle-splitting operation was performed under a local anæsthetic. The cæcum was œdematous and the appendix was found to be lying over the brim of the pelvis and surrounded by adhesions. The appendix was removed, the stump ligated, and a purse-string suture used for inversion. A tube was inserted into the pelvis for drainage. He stood the operation remarkably well. The appendix was found to be gangrenous and to have perforated near its base and also about half-way towards the tip. The drainage-tube was removed on Dec. 10th, about which time he developed chest symptoms and coughed up a quantity of dirty yellowish sputum. The chest condition improved, and beyond some slight cystitis he made an uneventful recovery and was discharged well on Jan. 4th, 1927. He is still living and suffers only from constipation and bronchitis. The operation scar has remained sound.

It is interesting to note that, in spite of a gangrenous appendix, the pulse and temperature were normal on admission to the hospital.

Medical Societies.

INTERNATIONAL SOCIETY OF MEDICAL HYDROLOGY.

ANNUAL MEETING IN ENGLAND.

THE first session of this meeting was held in London on Oct. 10th, when Sir HOLBURT WARING welcomed the delegates on behalf of the Vice-Chancellor of the University. When London had a permanent school of post-graduate education, he said, one of the subjects taught would undoubtedly be medical hydrology.

Dr. ALISON GLOVER conveyed the greetings of the Minister of Health and the Government, and said that he firmly believed in hydrology, both as preventive and curative. In no department was the international spirit more necessary, and this country had much to learn from its guests.

Lord DAWSON OF PENN was elected President and took the chair, after which Dr. C. W. BUCKLEY (Buxton) opened a discussion on the relation between

THE STATE, THE HEALTH RESORT, AND NATIONAL HEALTH INSURANCE.

Great Britain, he said, had lagged behind many continental countries in State ownership or control of health resorts. Spas furnished the best methods of treatment for rheumatic diseases, but their resources were inadequate and until recently they had been ignored by the Government and regarded rather as the playgrounds of the wealthy than the sanatoria of the nation. Necessary funds could only be obtained by high fees and aid from local rates, and bathing establishments were saddled with all the drawbacks of trading concerns. The difficulty could be partly overcome by extension of insurance benefits, but an ideal scheme demanded that spa treatment should be available for the uninsured also. A special contributory scheme should make possible not only spa treatment but also holidays adequate to prevent premature breakdown. The natural advantages of small health resorts should be developed, as they might be more beneficial than large centres to the neurasthenic and the sufferer from early arteriosclerosis. If poor patients were admitted to the same spas as the wealthy, any tendency to lower the popularity of the place with the rich would be combated by its increasing fame, as the skill and experience of medical practitioners would be highest where the number of patients was greatest. The local profession ought to organise team-work, and courses of instruction in physiotherapy could be arranged in the great mineral water hospitals. A diploma should be necessary before doctors were regarded as qualified to practise in spa work. There were three possible ways of organising the health resorts: (1) State organisation and control of small spas for poorer patients; (2) utilisation and development of spa hospitals for more serious cases and supplement of their income from approved society funds; (3) the establishment of clinics to provide medical care and research facilities for patients able to pay their own expenses. A State central bureau would be required to coördinate the scheme and financial aid would be necessary at the outset. Hospitals would be the best channel through which patients could make use of the facilities, since a municipal scheme would tend to bureaucracy and the approved societies could only deal with insured cases. The spa practitioners' group of the British Medical Association provided an ideal means of coördinating the profession to organise and influence the scheme. Teaching facilities should be arranged in connexion with the spa hospitals, and specialists in hydrology should be available in various centres.

Spa Work in Germany.

Dr. MAX HIRSCH (Berlin) described the part taken by health resorts in the development of health insurance in Germany. Private societies to run seaside hospitals for children had been followed by holiday colonies and forest sanatoria. The latter were open-air day schools near the town and were also maintained by private enterprise. Spa treatment and child welfare measures had developed on a large scale during and after the war, but hydrotherapy for soldiers dated from 1825. Insurance had been established in 1881, had been greatly extended since the war, and more than half the population were now insured. Natural mineral water cures were allowed to their members by all the great insurance societies, and the results of spa treatment had been exceedingly good. Insured patients took their cure more seriously than the uninsured, and stayed at the spa on an average 35 days. It had become more and more evident that cures in health resorts were no luxury but an important prophylactic and therapeutic factor in public health. Synthetic products were so much less effective than natural waters that the more expensive "natural" cure paid for itself by shortening the illness. Spas were being used increasingly for heliotherapeutic treatment of surgical tuberculosis. The State insurance institutes had erected numerous hospitals, sanatoria, and convalescent homes, with a total of 2800 beds.

Dr. ETIENNE then described the work at the German State spa at Bad Elster, of which he is director. The insured or poor patient, he said, obtained accommodation and treatment at reduced prices, and there were a number of homes in the spa, maintained by the State, for different classes of patient—e.g., employees, civil servants, nurses, and ex-officers—and furnished according to the social status of the inmates. Invalids went to hospital. Great care was given to the diet, which was that of the average German family of the official class. A home with less than 40 beds did not cover expenses. The charge made in the "social" homes was M.8.10 per day per person, and the average course was ten mud baths and five mineral baths. The system of having two classes of bathrooms was a bad one, as the mere fact of having to bathe in an inferior room was prejudicial to treatment. All the spa physicians and the railways reduced their fees to patients to whom the spa administration had granted a cure reduction. If the insurance organisation did not appoint a "confidential physician," patients were allotted to the spa doctors in rotation. The 1927 figures for Bad Elster showed a revenue of M.247,855 from the cure tax and of M.528,190 from the baths. The sum to be deducted for aided patients was M.93,418.

The Spas of France and Italy.

Dr. R. GLÉNARD (Vichy) described French legislation governing medicinal waters. It was complicated by the fact that some springs belonged to private owners, some to municipalities, and some to the State. More and more, public interest was replacing private rights, and recent amendments dealing with the collection, testing, exportation, and sale of the waters and the management of treatment establishments gave every possible guarantee of purity. The legal safeguards

were operated by scientific and administrative bodies. Special local taxes were authorised to provide financial resources. The poor had been able to obtain free mineral water treatment since 1796.

Prof. U. GABBI (Parma) said that there were about 700 spas in Italy yielding various waters, many of them radio-active. There was no uniform public health system, but each town had a "cure committee" of which one member at least was a doctor. The committees were governed by a central council in Rome, which authorised the public use of spas after thorough investigation. At certain important centres there were institutes of physiotherapy and research. The poor were granted special travel facilities and arrangements were made for workmen and trade-unionists to enjoy spa treatment. In some spas there were sanatoria for the poor, supported by the local authority or by charity. The "cure tax" was divided among the communes and the National Society for the Protection of Children and Mothers.

Sweden, Czecho-Slovakia, and Roumania.

Dr. G. KAHLMETER (Stockholm) said that there was no State health insurance in Sweden, but about 13 per cent. of the population belonged to private sick clubs, which did not, however, allow hospital benefit. There was a compulsory "old age and disablement insurance" scheme for everyone, and of about 375,000 of its pensioners some 35,000 were incapacitated by chronic articular rheumatism. Pensions to the sum of 5 million crowns annually were paid, and the Board had therefore adopted prophylactic measures, partly in three special institutions and partly at the small spas. Medical, nursing, massage, and dental aid were provided for the pensioners and two-thirds of the expenses were paid by the Board. After treatment 70 per cent. of the neuritic and 67 per cent. of the arthritic patients were able to earn their living. Arrangements had recently been made with hospitals to provide treatment for febrile patients and late cases requiring orthopædic care, but there was at present no provision for ambulant treatment.

Dr. L. SCHMIDT (Pistany) said that the spas of Czecho-Slovakia were enormous hospitals, ideally laid out, and were used by large numbers of the population. It was the duty of the State to see that the hygiene and research work of the spas was kept at a high level, and to fulfil this a balneological institute was to be erected. The State had the right to acquire treatment for its poorer citizens. The health insurance organisations had not yet fully realised the economic value of spa treatment.

The meeting then took as read a paper by General VICOL (Bucharest) describing the balneological organisation of Roumania, which dated only from 1924; the post-war reorganisation had restored to the country a great wealth of mineral springs, which the new law divided into larger and smaller. Important obligations were laid on the former, which numbered 25. In addition, there were 28 springs giving a variety of natural mineral waters. All watering, climatic, and tourist resorts were controlled by the Ministry of Health, and scientific work by the University Balneological Institute. Spa doctors were obliged to take a diploma. The State owned and ran a few health resorts to serve as models for the others, to regulate their prices, and to serve research and medical education. National health insurance covered most of the workers, but the intelligentsia and civil servants were not well organised. The Railway Labour Institute had done fine work and had erected sanatoria at the principal health resorts, and sent several summer colonies of tuberculous patients to the mountains. The Central Insurance Office also had three institutions in health resorts and three sanatoria; it had sent 3052 insured persons to health resorts.

Dr. JOHN MURRAY (Llandrindod) emphasised the tremendous importance of rheumatic diseases to the wage-earner and the State. Great Britain ought to have a scheme ready to enforce at once. To put chronic patients in a hospital was not giving them their best treatment, and a great deal of privacy and cheerfulness was needed for the average worker. This could be provided by approved lodgings. Speed was essential, and if the State would put down 2 or 3 million the scheme would go ahead and become a paying concern.

Dr. KERR PRINGLE (Harrogate) said that mineral springs must be recognised as public property, and be assisted by the Ministry of Health. The springs should be leased to the local authority at a small rental so long as essential hygienic conditions were fulfilled; a ring of 10 to 12 miles round the spa should be freed from noise, noxious industries, and all features inimical to health. Improvements should be made easier; at present a Bill was necessary. Spas should not be subservient to county councils. The advantages of State control outweighed the disadvantages.

At the session on Oct. 11th the subject of discussion was the

HUMORAL FACTOR IN DISEASE.

Dr. M. B. RAY (London) read the opening paper, reviewing the historical aspect of the subject. The humoralistic hypothesis, he said, dated from the *De natura hominis* of Hippocrates, wherein the theory of the four cardinal juices (blood, phlegm, black and yellow bile) was laid down dogmatically. Earlier philosophers had assumed that the human body was made up of four elements corresponding with the four primary substances; in the Hippocratic scheme the heart-blood was "warm moist," the yellow bile from the liver "warm dry," the black bile from the spleen "cold dry," and the phlegm secreted by the brain "cold moist." Health depended on the due balance of these juices, which were renewed by the food. Faulty admixture or abnormal accumulation caused disease. Outside influences, such as the seasons, affected the blending of the humours. In the spring blood predominated, in the summer yellow bile, and in the winter phlegm—as evidenced by colds. Galen's modification of this system could be made to fit any phenomenon. His therapeutics were founded on a concept of disease as a disorder of function, and one of the principal methods to be used was the expulsive, to evacuate noxious substances. The final blow to the general acceptance of the humoral theory was given by the recognition of Harvey's work on the circulation. The seventeenth and eighteenth centuries were marked by great striving after the formulation of physiological systems of medicine, and de Borden (1722–1776) had actually foreshadowed a "hormonic" theory. After a period during which clinical medicine had been based on the "static" revelations of pathological findings, the work of Virchow and Cohnheim and the later researches on internal secretions had shown that many diseases were only secondary results of metabolic disturbances or blood disorders. Fever, for instance, had to be regarded as a condition instead of a "substance," a thing in itself. The ancient idea of "purging the humours" found a modern application in the treatment of body fluids by eliminative measures which formed a substantial part of hydrotherapy. "Neohumoralism" implied a concept of disease as primarily due to changes in the body fluids, producing a dissociation of the functional unity of the organism considered as a whole.

Dr. P. FERRYROLLES (La Bourboule) related the humoral factor with spa treatment. Waters, he said, were useful almost exclusively for chronic diseases. Their manifestations depended upon humoral disorders: (*a*) of endogenous endocrine origin; (*b*) of exogenous toxic origin; (*c*) due to alimentary autointoxication. If the action of waters were better understood the origins of morbid humoral states would also be better known. How did kations of waters influence the kations in the body fluids? Waters operated by the infinitely little. The introduction of an electrolyte might overturn micelles and provoke a gel; demineralisation might change the

constitution of an albumin. A water might supply elements indispensable to the colloidal suspension of proteins. Lipoids fixed neurotoxic poisons. Lipoids were only mobilised in the body-fluids in a colloidal solution of soap; soaps were readily dispersed by waters. Therefore mineral waters were most powerful agents for the cure of chronic diseases.

Principles of Neohumoralism.

Dr. A. P. CAWADIAS (London) spoke of the present medical era as one of neo-Hippocratism, or neo-humoralism, as constituted by three principles: that of vitalism, that of ætiological integration, and that of pathological integration. According to the second of these the body was the unit, and no modification of any cell could be regarded as without effect on the other cells. In the course of development the chemical induction and irritability, originally common to every cell, became concentrated in the endocrine and nervous systems respectively. In man the integrative mechanism was triple—neuro-endocrino-humoral. The body being integrated as a whole, disease must also be conceived in terms of integration. The whole organism became diseased; there were no diseases of organs, tissues, or cells. Disease was a disharmony of life, a defect of adaptation, an irresponsibility to external conditions. These conditions acted through the integrative mechanism of the body, especially the nervous system. Diagnosis thus became triple: of local "disease," of personal functional conditions—to what extent the individual was injured by his complaint—and of ætiological combinations, the conditions which had brought about this "insufficiency of the person." Clinical examination and intuition were re-established in diagnosis, and treatment was founded upon a "constellation of causes." This meant that the specialist outlook was reserved for the surgical branch only. Specialisation in diagnosis was impossible. The scope of treatment was also widely extended. Chronic rheumatism, regarded as a lesion of the joints, could only be treated surgically; as a microbic effect only by antiseptics and extirpation of infective foci. But if we regarded it as the result of a defective reaction of the neuro-endocrino-humoral integrative mechanism toward a constellation of environmental conditions, we might, by acting through other external forces, create a good environmental constellation and re-establish the normal response of the mechanism. The dynamic point of view was being introduced into medicine.

Prof. E. H. KETTLE (London) stressed the particular affinity of certain micro-organisms for certain organs or tissues. The lesions of almost every group were so strikingly characteristic that it should be possible to find a much more rational therapeusis. Devotion to the humoral aspect of morbidity had done little to reduce the mortality tables, because the blood could not give an adequate picture of the effect of the invasion on the tissues most affected. Blood changes were often of great importance, but many of them were purely secondary and not vital. The question of infection depended entirely upon the tissues and not upon the circulating plasma. It should be possible to modify the process of infection by modifying the condition of the tissues involved, and the best results should be expected from a régime influencing the body as a whole. We had not, however, reached the time when we could disregard the results of infection in the body and devote ourselves to the consideration of a hypothetical complex.

Prof. A. DE M. SARMENTO (Coimbra) said that hydrology as it passed from a practice to a science could not remain a stranger to the doctrine which saw the origin of certain diseases in the fluids of the body. Humoralism had survived heavy blows, and the humours—as cradles of the hormones—were inexhaustible sources of pathological possibilities. Life demanded a certain proportion between the sodium, potassium, and calcium of the blood, and various other electrolytes played a part in metabolic processes. At the spa of Vidago, Portugal, he had found it essential to adapt his hydrological prescriptions to the humoral personality of the patients. For acidosis, waters were prescribed according to the electrolyte reserve of the blood, the pressure of carbon dioxide in the pulmonary alveoli, and the ammonia and sodium phosphate in the urine. For cholecystitis, whether with stone or not, the water was introduced directly into the duodenum, and in hyperchlorhydria indications were given by the hydrogen-ion concentration of the urine. The humoral factor allowed a rational interpretation of the genesis and course of morbid conditions; humoralism gave amplification and precision to the indications of therapeutic hydrology. The subcutaneous route was preferable to all others for securing the desensitising and "phylactic" action of mineral waters.

Dr. E. P. POULTON (London) spoke of the value of H. A. Ellis's work on the acid base equilibrium, and described an investigation by Dr. E. Obermer and himself of the urine in rheumatic patients. In a typical periarticular rheumatoid arthritis with marked wasting, the diurnal curves showed that the calcium loss was very high and that free acidity almost completely disappeared. The combined acidity was less reduced, so that the ratio between them became less than 1 : 2 and might be 1 : 4 or 1 : 5. The creatinine excretion was low, as would be expected where there was much muscular atrophy. The blood showed increased sedimentation and hydræmia, while the hæmoglobin, blood-calcium, and cholesterol were normal. The viscosity of the serum was high and there was an increase of serum proteins. In two cases the uric acid had been high but within normal limits, and in three there had been high acidity with high specific gravity and rather low volume. It was possible that this latter type of urine would prove to be associated rather with the osteo-arthritic case. An important point was the increase of sulphur, in all its forms, in the urine of these patients.

Dr. M. HIRSCH emphasised the importance of focusing attention on the patient—as did the Hippocratic school—and not on the disease.

(To be continued.)

ROYAL SOCIETY OF MEDICINE.

SECTION OF NEUROLOGY.

AT the opening meeting of this Section on Oct. 11th Mr. DONALD ARMOUR delivered a presidential address entitled

SOME CONSIDERATIONS ON HEAD INJURIES.

He said his main thesis was well represented by what John Bell wrote 125 years ago, to the effect that there was this encouragement to consider the pathology in place of the anatomy of the skull as the rule of prognostics that while anatomy and the enumeration and classification of fractures had led to an undue propensity to operation, the study of the living powers and the mutual dependence of these parts led to a reserved, modest, and rational practice, and to a careful and solicitous attention to all the insidious symptoms of an injured brain. Mr. Wilfred Trotter, in the present day, made a similar plea when he asked that in cases of head injury diagnosis and treatment should be kept in close association with pathology; and before attempting treatment the surgeon should make every effort to call up the clearest possible picture of the conditions within the skull of the particular patient. It was a pity that, even now, the subject of head injuries appeared in the text-books under the heading of "Fractures," resulting in a due consideration not being given to the functional or organic damage that the skull contents might have sustained. This was constantly shown by the early insistence, after head injury, on a skiagram of the skull being taken, as if the presence or absence of fracture were the most

important consideration, and as if this would give the best clue to the proper treatment. Indeed, it might constitute a pitfall in prognosis. There was also, Mr. Armour thought, a lack of appreciation of the importance of so-called "minor head injuries"; these might well become major at a later stage.

His main intention, therefore, was to direct attention to head injury without skull fracture. The commonest result of severe head injury was a general increase of intracranial pressure, brought about first by either reactionary œdema or hæmorrhage or both. It might be maintained or aggravated by interfering with the paths of absorption of the cerebro-spinal fluid. There was first a blocking of the cerebral subarachnoid spaces, so that the fluid collected in the basal cisterns and ventricles. The swollen brain, pushed up against the resistant dura, interfered still more with absorption, so setting up a vicious circle. Also there was direct pressure on the medulla of the fluid in the basal cisterns. Trotter said that the term "concussion" should be used to indicate an essentially transient state due to head injury of instantaneous onset; that it manifested widespread symptoms of a purely paralytic kind; that it did not, as such, comprise any evidence of structural cerebral injury; and that it was always followed by amnesia for the actual moment of the accident. But was it correct to say that concussion of the brain did not as such comprise evidence of structural cerebral injury? How was one to explain the onset and persistence of the post-concussion symptoms so often included under the term, which was a misnomer, "post-concussion neurosis"? It was easy to see that any sudden overfilling of the perivascular lymph space with cerebro-spinal fluid could cause laceration of a vessel by tearing its wall in the neighbourhood of a fibrillar attachment. Cassasa had suggested that sudden physical distension of the peri-ganglionic spaces by cerebro-spinal fluid caused, in cases of concussion, a direct physical change in the ganglion cell, which might explain all the phenomena of concussion of the brain; that the change might occur without minute hæmorrhages, and explained the complete negative findings at post-mortem examination in cases of concussion. Osuati and Giliberti, as a result of studying 100 cases of concussion, said that not only was there actual cerebral injury in concussion cases, but that in a few instances complete resolution did not occur; indeed, there was a strong likelihood that secondary degenerative changes developed. For these reasons those workers suggested, in place of "post-concussion neurosis," the term "traumatic encephalitis." In any case, Mr. Armour said, the symptoms usually following concussion were the expression of an altered pressure of the cerebro-spinal fluid, and an unstable pressure of it such as had been described in association with epilepsy. Mestrezat, Bouttier, and Logre found that 80 per cent. of a large number of concussion cases without head wounds showed definite changes in the cerebro-spinal fluid, chiefly an increase in tension and an excess of albumin. Those authors attributed this to an aseptic disintegration of nerve tissue without meningeal involvement, with a marked tendency to hypersecretion.

From a medico-legal point of view, the possible imitation of the "formula of concussion" in syphilis of the nervous system was a matter of great importance, so that when even a slight lymphocytosis was present a Wassermann test should be made. Claude, Lamache, and Dubar had investigated the cerebro-spinal fluid of patients with head injury but without skull fracture, very few of them having lost consciousness. The interval between receiving the injury and the fluid being examined varied from two or three weeks to several months. Relief was sought for such subjective symptoms as headache, dizziness, weakness, insomnia, tinnitus aurium, and visual fatigue. In only nine of 22 cases examined was there increased albumin, the excess tending to disappear as the symptoms subsided, following repeated lumbar puncture. The tension of the fluid, however, was altered in all except five of the cases.

Increased tension following slight injury might be due to such factors—acting either alone or in combination—as increase in the amount of the fluid secreted, interference with its circulation and absorption, variations in volume of the cranial contents (nervous, ventricular, and vascular).

The Effect of Trauma on the Choroid Plexuses.

The position of the choroid plexuses, said the President, rendered them particularly vulnerable to be affected by the direct action of a wave of repercussion at the time of the accident. Could such a trauma affect their secretory activity? Duret considered that trauma caused cerebro-spinal shock, tending to congest the brain mass and so produce intracranial hypertension—i.e., by lessening the cranial space, by venous stasis, and by the augmentation of the circulation, with increased flow of blood to the secretory organs (the choroid plexuses). There was also, probably, an irritation of the ependyma by waste products of disintegration in cases of minute pial hæmorrhages, and of post-congestion extravasations. In other words, hypertension could be attributed to hypersecretion of cerebro-spinal fluid. Leriche considered that the hypotension in head injuries resulted from the formation of a porencephalic cyst on the brain surface. The speaker thought several factors were responsible, such as a functional disturbance of the regulating centre for fluid tension, inhibition of the cells of the choroid plexuses, or local modifications of the cerebral circulation.

Following head injuries, there were changes in the shape and position of the ventricles. Block and Oppenheimer had made a comparative study of the intraspinal pressure, the blood pressure, and the intra-ocular pressure in cases of head injury. In all cases of skull fracture, though the blood pressure was below the average, the spinal pressure was above normal, and ocular pressure above the average. Their conclusion was that no individual parallelism existed between intraspinal pressure, arterial pressure, and ocular tension, but that, on an average, a high pressure of one type was associated with a high pressure of the other types. The same was true of low pressure.

Clinically, any attempt to estimate intracranial pressure in the light of general blood pressure findings was of no practical value. The initial shock following a severe head injury and lasting some hours, with the associated fall in the general blood pressure, would mask the true intracranial condition. Moreover, the intracranial pressure must reach a dangerous stage of compression before it could markedly increase the general blood pressure. Determination of the pressure of the cerebro-spinal fluid in head injury, both acute and chronic, was of undoubted importance, and it must be taken by a manometer. Ayer considered that normal pressure could be regarded as anything between 100 and 200 mm. of water; between 200 and 250 was "suspiciously high," and from 250 to 300 as definitely abnormal. The significance of blood in the cerebro-spinal fluid after head injury was often overrated; but it was a corroborative sign of intracranial injury, associated with bleeding from an intradural vessel. From the treatment standpoint the presence or absence of blood in the fluid was without importance. The important factor was the pressure of that fluid.

The Cranial Nerves after Head Injury.

Immediately after head injury, said the President, the pupils were dilated and were sluggish to light. Both conditions were increased during unconsciousness. The pin-point pupil in the early stage of supracortical hæmorrhage or œdema passed into dilatation as the stage of irritation passed into that of paralysis. Injury to cranial nerves occurred in about 12 per cent. of cases of head injury, usually in basal fractures. Varying conditions were concerned in the production of these paralyses of cranial nerves, the most frequent probably being injury of the nerve by bony compression. In some cases the cause might be compression due to a meningeal hæmorrhage.

He paid particular attention to the question of the effect of increased intracranial pressure in causing cranial nerve symptoms, especially what was termed by the French "papillary stasis." Cushing and Bordley showed how quickly retinal œdema could occur in certain forms of increased intracranial tension, especially after the introduction into the cranial cavity of fluid under tension, and how soon this disappeared when the tension was relieved. The amount of intracranial tension could be well estimated from an examination of the eyegrounds, as in head injuries with increased tension there might be papill-œdema proportionate in severity to the degree of the intracranial symptoms. Early signs were a dilatation of the retinal vessels (veins) with venous stasis, and a slight œdema. With increasing tension there was an œdematous blurring of the disc, possibly followed by the whole disc being obscured. Usually these changes did not take place within the first six hours.

The President entered a plea for the more frequent performance of lumbar puncture as a therapeutic measure in both acute and chronic head injuries; its value was not, in his view, appreciated as it should be in the profession. In mild cases of increased tension the slow withdrawal of fluid, repeated if needed, was of great value; it often allowed the postponement of an operation until conditions were suitable for it, or even might obviate it altogether. The pressure of the fluid was the determining factor. In cases not requiring decompression but suffering from severe headache, great restlessness, irritability, vertigo, &c., repeated lumbar puncture was an important mitigant. It was possible, as Weed and McKibbin had shown, to lower the pressure of the cerebro-spinal fluid by the intravenous injection of hypertonic solutions. Conversely, the brain mass could be increased by using hypotonic solutions. Fay found that the intestinal instillation of magnesium sulphate was almost twice as efficient as sodium chloride for the reduction of intracranial pressure. But over-dehydration might be serious, even fatal. For lowering intracranial pressure, Howe found that dextrose was quite non-toxic; it caused no disturbance of respiratory or cardiac action.

Dr. JAMES TAYLOR, as the doyen of the neurologists present, proposed, in a happily reminiscent speech, a cordial resolution of thanks to the President for his address, and this was seconded by Mr. GEOFFREY JEFFERSON (Manchester), and accorded by acclamation.

SECTION OF PATHOLOGY.

AT a meeting of this Section on Oct. 16th Prof. A. E. BOYCOTT gave a presidential address entitled

The Transition from Live to Dead: The Nature of Filtrable Viruses.

The natural view that live organisms were essentially different in their properties from dead matter had led, he said, to the endless controversy between vitalism and mechanism. If vitalism had had the best of the argument, it led to an unsatisfying position, often mystical and always dualistic. The mechanistic attempt to escape dualism and explain life by chemistry and physics had completely failed. The solution was to recognise the similarities rather than the differences between live and dead, and to regard the whole world as composed of units of varying complexity but inherently like one another. Recent progress in atomic physics had gone far in assimilating the behaviour of atoms to that of organisms. Instead of being stable and immutable it was now realised that the elements had a complex structure and went through processes of disintegration and reconstruction which were analogous to the life and death and evolution of live organisms. Especially was it now recognised that all matter and energy was discontinuous and existed in discrete units like live animals. In a world so arranged it was reasonable to expect to find units which were neither live nor dead in the ordinary meanings of the words; these intermediate things are represented by "filtrable viruses" and other similar "agents." These have the common properties of being very small (probably on the average about 0·025 μ in diameter), of unknown origin, incapable of independent life, and capable of some sort of multiplication. They seem to form a series grading from things which are plainly "dead" to things which are mostly "alive." The products of the autolysis of dead tissues stimulate growth of tissues and thereby potentially increase their quantity. Lysozyme would pass for an enzyme except that it is increased in amount by dissolving bacteria. The Rous sarcoma agent can hardly be called alive in view of the drastic treatment in separation and purification which it withstands; it is generated in the tumour and can be made to cause the growth of an indefinite amount of tumour tissue by dispersing it among animals, but like other viruses it multiplies only when it exhibits its specific activity. Similarly the bacteriophage probably originates from the bacilli with which it is associated; it increases in quantity only when the bacilli multiply. None of the viruses which cause disease in animals or plants has certainly been cultivated in the absence of cells though the technique necessary for this will probably be discovered. Normally they multiply only in the presence of live and usually growing cells, in the body, or in tissue culture. There is no evidence that the particles of virus which are obtained from an infected animal are the direct descendants of the particles which were used for inoculation, and it is possible, therefore, that their multiplication is indirect as it is with the products of autolysis, the Rous agent, and the bacteriophage. A virus, then, may be at once the cause and the result of a lesion, affecting cells in such a way that they produce more of it. The phenomena need to be interpreted on their own merits and not by analogy with bacterial diseases.

It is difficult to believe, said the PRESIDENT, that small-pox, for instance, is not usually caused by virus disseminated from a case of the disease, but herpes, to take another example, not only has no association with itself but has a definite connexion with certain bacillary infections, and it seems quite likely that the virus is constantly arising afresh. The rabbit disease due to virus III. is produced by inoculating one rabbit with a testicular emulsion of another rabbit and once started can be propagated indefinitely in series. Similarly, Murphy, Leitch, and Brebner have obtained the carcinogenic virus from normal tissues from which it is usually generated under the influence of some external stimulation.

NATIONAL ASSOCIATION FOR THE PREVENTION OF TUBERCULOSIS.

ANNUAL CONFERENCE IN LONDON.

THE fourteenth annual conference of this Association was opened on Oct. 15th by the Hon. Sir ARTHUR STANLEY, who extended a special welcome to the Canadian delegates, and spoke of the "world war" now being waged against this terrible scourge.

Dr. R. G. FERGUSON (Director of Medical Services, Saskatchewan Antituberculosis League) read a paper on

Tuberculosis among the Indians of the Great Canadian Plains.

About 1884, he said, tuberculosis among the Indians had assumed the proportions of a serious epidemic. The acute phase had lasted less than two decades, but even now the death-rate was about 800 per 100,000. All varieties of the disease had existed, but adenitis had particularly affected all ages; death had been most usually due to pulmonary tuberculosis. Many acute cases had become chronic and recovered, the maximum fatal susceptibility having been under 5 years of age. 26·86 per cent. of the first generation had succumbed, 32·7 per cent. of the second generation, or generation of childhood infection, and 20·46 per cent. of the third generation, or those whose parents had been tuberculised before

fecundity. A study of 147 families traced through three generations had suggested that those who had died had been non-resistant to disease generally, rather than lacking in resistance to the specific bacillus. An infusion of white blood had appreciably increased the mortality of the children, although the morbidity did not appear different. Children entering school at an average age of 7½ were sensitive to tuberculin in 60 per cent. of cases, but between 11 and 15 years of age over 96 per cent. were sensitive. The type of disease developing among them was either a minimal local lesion or else a rapidly fatal infection. Those who succumbed would probably not have responded to rest and hygiene, but would have required prophylactic immunisation.

The epidemic was now on the wane, and the Indians had been generally tuberculised, although the mortality was still 20 times that of the surrounding white population. There had, however, been no loss of infectiveness or of virulence, as shown by the sensitivity of the school-children to tuberculin and the rapidity of 15 recent fatalities. The cattle were more or less tuberculised, only 7 per cent. of reactors having been found; until recently the Plains Indians had not consumed milk products much and had lived on buffalo meat. The bacillus in every one of 15 glandular specimens had been human. It was clear that resistance was an individual and not a family trait, and that those who survived belonged to families who were more prolific and more resistant to white men's diseases generally. In the process of civilisation just over every second family tree had died out within three generations, and practically all families had suffered from tuberculosis. Resistance far outshadowed other factors, such as food, housing, and sanitation. The most important predisposing factors were acute epidemic diseases, such as whooping-cough, measles, and influenza, and food appeared more important than housing. Food, housing, and sanitation had much effect on mortality but little on morbidity. The resistant type of Indian child responded as well as a white child to sanatorium treatment. The processes by which resistance had been increased were many, and included (*a*) elimination of the weak and unresistant; (*b*) infusion of resistant white blood by crossing; (*c*) sensitisation of soil in the third generation; (*d*) improved living conditions. Childbearing had no effect on the resistance of women. The surviving Indians were biologically strong, with a high birth-rate of healthy infants.

Dr. JOURDRAN then read a paper by Dr. J. J. VASSAL (ex-Director of Health of French Equatorial Africa) on

The Occurrence of Tuberculosis among Peoples in Equatorial Africa.

Dr. Vassal said that investigation of the ætiology of tuberculosis among the inhabitants of unexplored regions might open out new avenues and greatly increase our knowledge. The unparalleled mix-up of races during the war had exposed hitherto isolated peoples to infection of all kinds, and men of science had greatly profited by the lessons this "experiment" had taught. Primitive races, far from being immune to tuberculosis, were particularly sensitive, and climate, season, and latitude played a very small part in producing immunity. What counted was repeated vaccination in infancy, producing a chronic disease which conferred a state of resistance, if not an immunity. It had been established now that the general distribution of tuberculosis in the urban centres of Europe followed certain rules; 55 per cent. of children up to the age of 5 reacted to tuberculin cuti-reaction, and not more than one-tenth of adults had escaped contamination.

The mortality in Europe varied from 11·8 per 100,000 in Portugal to 15·9 in England, 22·6 in France, and 37 in Hungary. The big towns were twice as badly affected as the country. In America the mortality had been lowered from 195 in 1900 to 112 in 1920, but was still high in States where there was a large coloured population. In Asia tuberculosis was prevalent among Chinese, Hindus, and Japanese in about the same proportion as in Europe. Young women in India were extremely liable to tuberculous infection. The scourge was rare in the desert areas of Australasia, but assumed European proportions in the towns. In the Philippines in 1908 the death-rate was 486 per 100,000, and the Caroline Islands had been decimated by tuberculosis.

Africa was the most interesting of the continents. The countries which had long been open to commerce and civilisation were comparable with Europe, but the interior regions showed peculiar features. Tuberculosis in the French colonies had been investigated by the Pirquet reaction and the Calmette methods. In the old colonies the disease followed the same course as at home, but in those recently opened up there was a very strong reaction. The average incidence among adult natives in Algeria, Tunisia, and Morocco was 52·8 per cent., but in the oasis of Figuig and of the extreme south it was 22 and 26 per cent. respectively, falling to 18 per cent. for isolated desert tribes. Senegal had been occupied since 1626 and had long been recognised as a source of tuberculous infection; figures given varied from 12·5 to 35 per cent. for children, and tuberculosis was responsible for 23 per cent. of the general death-rate in the native hospital of Dakar in 1925–6. The return of black soldiers from France had constituted a grave danger. La Réunion was one of the oldest colonies, and the inhabitants gave a cuti-reaction of 81 per cent. The French Antilles were widely infected, about half the population giving a positive reaction. Thanks to Prof. Calmette, much work had been done in French Indo-China, where the infection among the dense population was heavy. The newer group of colonies included Guinea, the Ivory Coast, Dahomey, Mauretania, and the French parts of the Sudan and Nigeria. The figures available varied between 3 and 17 per cent. Dr. Jourdran himself had investigated the densely forested hinterland of Liberia and had encountered no case of tuberculosis among the indigenous population, although syphilis and malaria were rife. Madagascar was heavily infected, but the disease was rare in the Cameroons, although the people were very sensitive to it. In many of the French islands of Oceania tuberculosis was decimating the population, and the severity of the disease on any given island seemed to be proportional to the number of Europeans. In French Equatorial Africa, where the poor living conditions had greatly enhanced the virulence of all kinds of infection, tuberculosis had respected the populations already subjected to other infections and had not reached the interior. Where it had taken root it had spread with great rapidity. In the Belgian Congo Europeans showing signs of consumption had to leave within three months, in order to protect the natives. Experience of leprosy, dengue, and other infections had shown that any disease entering a new country for the first time acted in a special way. The resistance of a race was derived from hereditary factors fixed in the blood. Tuberculosis among black troops was to be compared with that of guinea-pigs and monkeys in the laboratory, and took a course like that of the disease in children. When primitive races came into contact with civilised ones an infection occurred, assuming first a short latent glandular phase, especially associated with supraclavicular enlargement, and a second dramatic miliary and caseating phase with pleural and massive abdominal lesions. It was independent of country, climate, and environment. It was probably quite impossible to prevent this contamination, though steps might be taken to postpone it. The only method of attenuating the danger at present was vaccination by the B.C.G. of Calmette.

At the afternoon session Prof. S. LYLE CUMMINS (Welsh Memorial Association), making a plea for

Preventive Medicine among Dependent Races,

said that Western Europe and America had adapted to the tubercle bacillus, just as they had to their climate and to life in urban aggregations. This was

manifest in the steady fall in tuberculosis incidence and mortality since the middle decades of the last century, and in the gradual tendency for the age-period of maximum incidence to fall. This adaptation had not taken place in Africa, Asia, and Eastern Europe. Prof. Cummins related his experiences in Africa, where he had seen the primitive aboriginal natives, free from tuberculosis in their isolated homes, fall victims directly they were recruited.

As in Europe there were fairly clear-cut differences in the clinical and pathological manifestations of tuberculosis according to age and sex, so in Africa and Asia there were similar differences according to the type of culture and to the degree and period of contact with Europeans. C. Roubier had called attention to this and correlated the disease of various racial groups with that of our age-groups. The former might be spoken of as "stages of tuberculisation," each stage implying a degree of adaptation and resistance. There was no more important question for an Imperial Government responsible for the guidance of numerous populations of varying cultural and racial types than this one of the degree of risk which each type ran under new and unfamiliar conditions of life.

The tuberculosis from which the native miners of South Africa suffered differed from that of the primitives and from that of Europeans. The former might be compared with our infantile tuberculosis, while the disease among Annamese and other peoples who had long been in contact with a rural civilisation was more like that which afflicted older children and adolescents with us. That of the South African miner was midway between the two.

The opening up of the mining industry had drawn all types of natives from all sources together, and they had been housed in dark, overcrowded compounds, believed by the owners to be no worse than the native kraals. The mortality from pneumonia, meningitis, and tuberculosis had been terrible, and those who had survived to return home had taken with them the seeds of endemic disease. The owners had, however, realised their responsibility, and also the economic value to themselves of ensuring the health of their workers. Experts had been invited to help in the fight, and the position had, in fact, been so revolutionised that now the native miners were healthier after their service than before. If they could be protected from bacterial disease they gained weight and returned richer in pocket and well set up and fit. The actual incidence of tuberculosis in the gold-mining industry was hard to determine, because the men worked on short contracts, and many must die untraced or become ill after repatriation. Incidence and mortality had undoubtedly fallen in recent years, and was now estimated as not much higher than among European mining populations. Those who succumbed, however, showed a much more generalised and formidable type of infection with less tendency to cavitation and fibrosis than was common in Europe. Yet this was not a "virgin soil" infection, as tuberculin-testing showed 80 per cent. of positives. The native population was more or less tuberculised, but nevertheless the infected healthy native was much more liable than the infected healthy white man to suffer from widespread fatal generalisation of his disease when he worked in mines, comparable with the galloping consumption of young agricultural workers over here who went to work in cities. This proved that he was less resistant than the South African of European stock, probably because the disease had not been endemic for more than 50 years or so. The facts suggested that the power of acquiring resistance to tuberculosis might depend on inherited factors. The returning workers did not heavily infect the kraal population because it was so scattered; perhaps only the immediate relatives would be seriously affected. Prof. Cummins ended with a plea for the native races, pointing out that within a few generations we should either be guilty of the deaths of numbers of subordinate peoples from preventable disease or else provide them with working conditions consistent with their health. The gold-mining industry of South Africa had set an example to the world. The lessons it taught were that the type of compound provided for African natives should have a generous allowance of airspace and ventilation; that their rations should be full and well balanced; that the entry of native recruits into industry should be by easy stages; that pulmonary examinations should include an X ray of the chest; that weights should be recorded periodically to detect early cases; and that "old boys" should be periodically examined, as they tended to have chronic disease and to spread infection among newcomers. B.C.G. vaccine appeared to have only a restricted value for native populations.

Dr. S. J. MAHER (Chairman, Connecticut State Tuberculosis Commission) denied the statement, so often made, that tuberculosis was unknown among North American Indians until introduced by white men. Le Jeune had recorded in 1633: "Nearly all the young Indians were attacked by scrofula both on account of their filthy habits and because they eat and drink indiscriminately with the sick," and there were many later Jesuit records of scrofula and consumption. Skeletons more than two centuries old showed tuberculous bone lesions. Dr. Maher quoted many writers from that time to the present century, showing that American Indians, even in the wild, suffered from tuberculosis, and that the doctrine that tuberculosis had been a curse passed along by the white race was entirely false.

Dr. C. W. SECCOMBE described his experiences in Equatorial Africa, which confirmed those of previous speakers. He had seen very little tuberculosis. It was impossible to get on without the native and impossible to do with him unless he could be kept fit.

Dr. E. E. PREST (Ayrshire Sanatorium) pointed out the importance of preventing people who had not had much contact with tuberculosis from being suddenly brought against very large or very virulent doses. He regarded food, abundant and of the right kind, as the most important factor in building up resistance.

Dr. A. S. LAMB (Victoria, B.C.) described a survey of Indians made by the Canadian Tuberculosis Association. About 732 cases on the coast had been investigated in the summer of 1926 by physical and fluoroscopic examination and sometimes the cuti-reaction. The total incidence was 10 per cent. and was greatest between the ages of 5 and 14. Children of 12 gave a positive cuti-reaction in 90 per cent. of cases. The incidence had been very much the same among 528 Indians of the interior dry belt investigated last summer, except that these had more glandular tuberculosis than those on the coast, who were well-nourished fishers and hunters, rather more civilised, and decidedly cleaner in their person and homes.

Dr. A. C. LANKESTER said that his three years' experience in British India confirmed what workers in Africa had said. It was not the white race but the mistakes of civilisation that had brought the curse, and the greatest mistake of all was the Purdah system.

(To be continued.)

RADIUM FOR SHEFFIELD HOSPITALS.—A supply of radium has been acquired for use in the hospitals associated with the University of Sheffield—the Royal Infirmary, the Royal Hospital, and the Jessop Hospital for Women.

ANCOATS HOSPITAL "HOPELESSLY INADEQUATE."—Ancoats Hospital, which is this year keeping its centenary, stands in the heart of the industrial centre of Manchester, but it is officially described, in an appeal that is being issued for £100,000 for extensions and improvements, as "hopelessly inadequate." It treats 20,000 casualties a year, and last year over 3000 operations were performed in its single theatre; there are often 200 casualties waiting for treatment. There are at present 114 beds and one theatre, but at least 300 beds and three theatres are deemed necessary. It is hoped that the response to the appeal will permit of the addition of 100 beds, another theatre, a separate casualty block, a permanent massage department, enlarged X ray and pathological departments, and additional accommodation for the staff and nurses.

Rebiews and Notices of Books.

BIOLOGICAL METHODS.

Methods of Biological Assay. By J. H. BURN, M.A., M.D. Camb. With an introduction by H. H. DALE, Sec.R.S., M.D., F.R.C.P. London: Humphrey Milford, Oxford University Press. With 22 illustrations. Pp. 140. 8*s.* 6*d.*

THIS work gives a complete account of methods of standardisation of those drugs which can be assayed with a sufficient degree of accuracy by biological methods. Dr. Burn has himself contributed considerably to the subject, and the book bears evidence throughout of his practical acquaintance therewith. The various methods are described with an attention to detail which on a hasty glance might seem almost too meticulous. But every laboratory worker knows how much more valuable descriptions of experimental methods are when given in full detail; apparently trivial points make all the difference between success and failure. A large number of alternative methods for the standardisation of the digitalis group is included. Attention is drawn to the fact that the U.S.P. requires that 1 c.cm. of a 10 per cent. tincture of strophanthus shall be equivalent in action on the frog to 8·3 mg. of ouabain, whereas tinctures of strophanthus on the English market are equivalent, on the average, to about 3·5 mg. per c.cm. The explanation of this curious discrepancy is not clear. It is worth while pointing out, however, that since strophanthin (Kombé or Hispidus) has certainly not more than 80 per cent. of the toxicity of ouabain for frogs, seeds which would give a tincture of the required U.S.P. potency would contain more than 10 per cent. of strophanthin, which is an improbably high figure. The maximum figure given in the literature for strophanthin isolated by chemical means is 3·6 per cent. A chapter on the standardisation of extracts of posterior lobe, in addition to the standard methods for oxytocic and pressor potency, contains an account of a method worked out by Dr. Burn for the quantitative determination of antidiuretic action of pituitary extracts. Chapters on insulin, ergot, arsenobenzene derivatives, adrenalin, œstrin, and various minor tests are also included. Not the least valuable part of the book is the insistence throughout on the necessity for the deliberate evaluation of the error of the various methods described, and the point is emphasised in a special chapter.

Objection has been raised sometimes to the use of biological methods of assay at all, because the results are only approximate. But approximation is, after all, only a relative term. Absolute accuracy is an unrealisable abstraction, though it is true that the 0·1 per cent. error that will satisfy a chemist would horrify a navigator. If a 10 per cent. accuracy can be obtained when estimating the potency of insulin, no clinician is likely to discover real differences between successive batches. But it is essential for the proper use of biological assay that the degree of approximation attainable should be definitely sought out, and Dr. Burn's insistence on this point is of great importance. The introduction by Dr. Dale is full of the wisdom of long experience of these methods. Dr. Burn's work is one which will repay reading, not only to those directly engaged in standardising drugs, but to general physiologists, chemists, and clinical workers.

Biological Monographs and Manuals. General Editors, F. A. E. CREW, Edinburgh, and D. WARD CULTER, Rothamsted. *Statistical Methods for Research Workers.* Second edition. By R. A. FISHER, Sc.D., formerly Fellow of Gonville and Caius College, Cambridge; Chief Statistician, Rothamsted Experimental Station. London and Edinburgh: Oliver & Boyd. 1928. Pp. 269. 15*s.*

IN this volume Dr. Fisher gives us a second edition of the text-book first published three years ago. The main body of the work is unaltered, but a short method of fitting polynomial regression lines has been added, and the table for the distribution of the variable "z" derived by transformation from the correlation coefficient has been enlarged. The only other addition is that of a chapter on the principles of statistical estimation. A discussion of this important subject is not usually found in an elementary text-book, and the differences in the results arrived at in a simple problem by different methods of estimation will be instructive to the student. The chapter is not easy reading for non-mathematicians, but it follows the lines of the rest of the book in putting before the research worker the latest results of Dr. Fisher's own work without going into mathematical theory. There is something to be said for this way of approach from the point of view of those workers who are concerned with practical statistical procedure, and not equipped to follow elaborate mathematics, but those who want to refer to the original papers will wish that the list of sources given had corresponding references in the text. The book covers wide ground not easily found elsewhere in elementary form. It deals especially with the most modern methods suitable for use with small samples, and aims at the type of problems which continually turn up in practical laboratory work. It needs and will repay careful study.

Modern Biology. By J. T. CUNNINGHAM. London: Kegan Paul, Trench, Trübner and Co. 1928. Pp. 244. 10*s.* 6*d.*

Mr. Cunningham has always been something of a biological nonconformist and we warmly welcome this volume, in which he brings his critical capacity to bear on many of the vexed problems of current biology. He treats especially of the mechanistic conception of life and of the inheritance of acquired characters and ends with a chapter on mind and consciousness. It is impossible to summarise what he has to say on these different topics; we may, however, specially mention the convenient critical accounts which are given of Tornier's views on abnormal goldfish and of MacDougall's experiments on the inheritance of reactions which white rats have learned and experienced through a number of generations. Biological experiments are surely very difficult—and perhaps even harder to interpret than they are to do.

NUTRITIONAL DISEASES IN CHILDHOOD.

Die Nährschäden des Kindes: ihre Entstehung, Verhütung und Heilung. By HANS ARON, Professor für Kinderheilkunde, Friedrich-Wilhelms University, Breslau. Berlin and Vienna: Urban and Schwarzenberg. 1928. Pp. 152. M.6.60.

DISORDERS of nutrition, although by far the commonest cause of ill-health in infants, receive curiously little attention either in the curriculum of the medical student or in text-books. Prof. Aron has, therefore, done medicine a service by preparing a book dealing exclusively and exhaustively with the cause, prevention, and cure of nutritional diseases in childhood. Knowledge of this subject is, as he points out, comparatively recent; every fresh medical discovery or investigation clashes with some preconceived opinion, and widely different theories on infant feeding are held by different schools. It is not the author's aim to discuss theories or schemes in any detail, but to collate the results of experiment and of clinical experience in the attempt to place the whole subject on a more scientific footing. Prof. Aron, writing for the practitioner as well as for the specialist in children's diseases, bases his monograph mainly upon cases met with in his own practice, rather than upon theoretical considerations or upon interesting or impressive cases recorded in the literature. He classifies disorders of nutrition according to their ætiology, the most important clinical types arising respectively in breast-fed and in artificially fed infants being considered. The use

of butter-milk is advised in many cases of under-nourishment in both types of feeding; its source and preparation are described in detail. In artificially fed infants the author is particularly concerned with the dangers of minimum feeding, suggesting that it is as harmful to reduce minimum doses of nourishment as it is to exceed maximum doses of medicine. One of the most interesting chapters deals with the faulty treatment of diarrhœa usually adopted, which treatment Prof. Aron looks upon as the most important cause of nutritional disorders in infancy. Details are given for the treatment of dysenteric diseases, in which butter-milk in conjunction with human milk is said to be the best "healing" diet, although one which in practice is not often available. Nutritional disorders arising from deficient albumin (in breast or cow's milk), carbohydrate, or vitamin content are discussed in turn, and the appropriate dietetic therapy indicated. "Thirst" diseases receive a chapter to themselves, the author pointing out, what is often forgotten, that the child requires, relatively, much more water than the adult. Prof. Aron urges in conclusion that "nutrition therapy" should receive at least as much attention in medical teaching and practice as any other form of therapy, medicinal, operative, immune, or physical. He believes that, were this ideal adequately carried out, disorders of nutrition in infancy would almost entirely vanish, and would be known only by name to future generations of medical students and physicians. His book is well worth reading, and may be warmly commended to all practitioners who have the care of infants and young children.

ON THE DYSENTERIES OF INDIA.

With a Chapter on Streptococcal Infections and Sprue. By H. W. ACTON, Professor of Pathology and Bacteriology, Calcutta School of Tropical Medicine; and R. KNOWLES, Professor of Protozoology to the School. Calcutta: Thacker, Spink, and Co. 1928. Pp. 178. Rs.7/8.

FOR their teaching of Indian post-graduate students in Calcutta the conjoint authors of the Dysenteries of India have come to recognise the need of a handy text-book on this subject, embodying the very real advances which have been made during and since the war. Although dysentery in its various forms is widespread throughout India, ranking as the third most important cause of mortality, yet the disease has never been the subject of any research expedition such as those organised against kala-azar and plague. This book clearly sets out the knowledge already gained and indicates the problems that remain to be solved. It is divided into nine chapters, dealing with the mortality and seasonal variations of dysentery in India and the relative incidence of the two main forms. The authors particularly emphasise the greater frequency and severity of the bacillary disease, a point which has been regrettably overlooked in spite of the experience during the war. Stress is rightly laid upon the proper use of the sigmoidoscope and the value of this method of diagnosis of dysenteries, but unfortunately the varied appearances are not described in sufficient detail to provide an accurate guide, and there are no explanatory illustrations. The bacteriology of bacillary dysentery is given in considerable detail, but the account appears to us to be unnecessarily complicated, including as it does much work which has not survived the test of experience. Moreover, the inclusion of streptococcal infection secondary to bacillary dysentery in a chapter devoted to sprue may give rise to the faulty inference that the latter disease also is secondary to dysentery.

A useful appendix containing seven pages of references shows signs of having been compiled in haste, for credit has occasionally been given to workers whose claim to priority is doubtful. In a second edition, when these small points have been revised, the book will serve admirably the purpose for which it is intended. The illustrations are excellent throughout. Those borrowed from Baermann and Eckersdorff's Atlas of Tropical Intestinal Diseases, published in 1913, are marvellously fine, and have brought to notice the existence of a work which was in danger of oblivion.

CLINICAL MEDICINE.

By OSCAR W. BETHEA, M.D., F.C.S., F.A.C.P., Professor of Therapeutics, Tulane Graduate School of Medicine: Chief of Medicine, the Baptist Hospital, New Orleans. London and Philadelphia: W. B. Saunders Company. 1928. Pp. 700. 35*s*.

THE preface states that this book is intended to occupy the gap in medical literature between large systems of medicine, running into several volumes, and condensed summaries. On such a plan 700 pages are clearly insufficient to cover the whole field of medicine, and the volume deals with only about a hundred of the conditions most commonly met with in medical practice. In making a selection for practitioners in England one would have omitted rare conditions—for example, dengue and tularæmia—and have included some at least of the manifestations of syphilis and such common nervous diseases as disseminated sclerosis or sciatica.

Each disease is discussed under the usual headings of ætiology, prognosis, diagnosis, and treatment, of which the last is in every case the most valuable. Those sections dealing with prognosis and diagnosis, though they include all the features of the disease in question, present them in such a way that important and characteristic points are not sufficiently emphasised. Hence the student is unlikely to gain a clear mental picture of the disease from them, nor will they assist a practitioner in differential diagnosis. On the other hand, the sections dealing with treatment are full, and the measures recommended sound and orthodox. Due attention is given to the general management of the case, which is too often neglected. Even if some of the suggestions prove to be impracticable, there can be no harm in setting out an ideal to be aimed at. Here, again, too little contrast is drawn between measures of first importance and those which are less valuable.

The book will, we think, be chiefly of value to the busy practitioner who, when a diagnosis has been made, wishes to decide what line of treatment to adopt.

LES TUMEURS VILLEUSES DU RECTUM.

By ANDRÉ LAMBLING, Ancien Interne des Hôpitaux de Paris. Masson et Cie. Pp. 120. Fr.18.

THIS monograph deals in an extremely practical manner with a condition which, according to Dr. Lambling, is more common than is usually supposed. His conclusions are based on a study of 37 cases of villous tumour of the rectum from the clinics of Dr. R. Bensaude and Prof. P. Lecène, Paris. After discussing ætiology, symptoms, and methods of diagnosis, the author discusses the pathology of the condition. Macroscopically three types may be distinguished—pedicled, sessile circumscribed, and diffuse; he points out that multiple tumours are common and easy to miss, which may explain some recurrences after apparently complete excision of a localised villous tumour. The diffuse form sometimes constitutes really a villous disease of the rectum (four cases). Ulceration is not necessarily evidence of malignancy, but may be inflammatory. Microscopically Dr. Lambling describes three types: (1) the benign villous tumour (18 cases); (2) the villous tumour with malignant degeneration (15 cases); and (3) villous malignant tumours (4 cases). He gives a clear description, illustrated by a series of good black-and-white drawings of the histology of the condition. He considers that malignant change often occurs first at the margins of the tumours, but the fact that it may remain localised for a long while renders surgical treatment possible even when delayed; this is fortunate, since it is easy to miss an early malignant degeneration. Chapter V. deals with

diagnosis; the importance of sigmoidoscopy is emphasised, and cases are described to illustrate the fallacy of assuming colitis to be the cause of diarrhœa without adequate examination. For treatment surgical excision is the method of choice; local excision after stretching the anus under spinal anæsthesia has been the most common procedure. It is essential to excise a circle of healthy mucous membrane with the tumour or recurrence is inevitable. For diffuse or malignant tumours some form of perineal excision may be required, or rarely an abdomino-perineal operation. Radium and deep X ray therapy were used only in inoperable cases, or where the patients refused a cutting operation. On the whole the results of radiotherapy have been extremely bad, and in certain cases it has been followed by rapid dissemination. Detailed case reports of 37 cases are included.

The volume constitutes a valuable addition to our knowledge of these tumours.

DISEASES OF THE BLOOD.

By A. PINEY, M.D., M.R.C.P., Research Pathologist, London Cancer Hospital. London: J. and A. Churchill. 1928. Pp. 195. 12*s*. 6*d*.

"THE student," says the author in his preface, "does not want much hæmatological detail, and the practitioner only requires bare outlines of immediate practical value." Some may be inclined to think that Dr. Piney puts the requirements of student and practitioner alike at rather a low level; but none can deny that, working on the basis that this level is the right one, he has written an excellent book. The arrangement is satisfactory, the matter up to date, and the author has managed to keep the number and variety of the technical terms used well in hand. The book is free from controversial matter which is something of a triumph in compromise, seeing that the author deals with the origin of the cells of the blood, the nature of "Banti's disease," and a number of other matters which continue to rouse hæmatologists to more or less heated polemics. It should have a wide popularity among students with their eyes on examinations and among the very busy practitioners mentioned in the preface.

BLACK'S VETERINARY DICTIONARY.

Edited by WILLIAM C. MILLER, M.R.C.V.S., Lecturer on Zootechny and Animal Management in the Royal Dick Veterinary College. With Contributions by a number of Authorities. London: A. and C. Black, Ltd. 1928. Pp. 1081. 21*s*.

THE Veterinary Dictionary, which has been modelled upon the plan of Black's well-known Medical Dictionary, is intended for all who own or have charge of domesticated animals, and for this reason the information contained in it is given in simple language, avoiding the dangerous knowledge which comes from only half understanding of scientific terms. Enough anatomy and physiology is included to lead the reader to recognise symptoms and so to be in a better position to initiate first-aid treatment. The book is more than a popular encyclopædia, for it contains a series of articles, amounting almost to monographs, by scientific writers. Dr. T. W. M. Cameron, for instance, of the London School of Hygiene and Tropical Medicine, contributes an article on parasites and parasitology, while Dr. F. A. E. Crew, Director of the Animal Breeding Research Department, Edinburgh, gives an outline of genetics and heredity which should serve to put the reader in touch with the scientific basis of animal breeding. Other signed contributions to this volume are from the pens of Prof. R. G. Linton (diet and dietetics), Mr. D. S. Rabagliati (cattle plague and other epizoötic diseases), and Prof. J. F. Shirlaw (new growths in animals). The volume is attractively printed and illustrated, and should appeal to a wide circle of those interested in animal health and disease.

MEDICAL RADIOLOGY.

Ergebnisse der Medizinischen Strahlenforschung. Edited by H. HOLFELDER, H. HOLTHUSEN, O. JÜNGLING, and H. MARTIUS. Leipzig: Georg Thieme. Vol. I., pp. 748. M.45; Vol. II., pp. 594. M.52.50.

THESE volumes begin a new radiological series, of which further volumes are promised at intervals of about a year. The editors aim at a complete presentation of certain selected subjects, combining original research with a critical survey of the literature, and they have achieved that aim by narrowly limiting the scope of each article and by entrusting each problem to experienced hands. The subjects appear to have been chosen somewhat at random, but in every volume there is new matter of diagnostic and therapeutic interest.

To Vol. I. Dr. A. W. Fischer constitutes a useful article on growths of the colon, with special reference to the diagnostic method of barium enema combined with air injection. E. Friedl and H. R. Schinz discuss the ætiology and X ray appearances in acute bone atrophy, and A. Lorey writes on miliary tuberculosis of the lung. The remaining articles deal with the physical theory and biological effects of radiation. Holthusen's "Physical Sensitisation" summarises what is known of the use of secondary radiation to enhance the biological effect of X rays. H. R. Schinz and B. Slotopsky contribute original and excellent experimental material upon irradiation of the testis in the rabbit. W. Lahm and H. Kurtzahn describe radiotherapy respectively in cancer of the cervix and cancer of the œsophagus. Lahm's article is practical, modest in its claims, and based upon the comparative results from all the great clinics, which he gives in detail. In Vol. II., H. H. Berg's fine article upon duodenal ulcer carries Akerlund's work a stage further, and is an outstanding achievement. If there are any radiologists in this country who do not use the "direct method" in the diagnosis of this condition, we feel sure that Berg's article will convince them of its value, while the others will find valuable technical hints and helpful ideas therein. The rôle of radiology in diseases of the central nervous system is described by O. Jüngling (ventriculography), and by H. Peiper (lipiodol). There is a good article on mediastino-interlobar effusions and their diagnosis by Felix Fleischner, of Vienna. The section on treatment comprises articles on the action of radiations on the acid-base equilibrium, on the ovaries, and in the treatment of bronchial asthma. Sections on diathermy of the bladder and on treatment of carcinoma of the tongue complete the volume.

The publishers have spared no pains to make the book worthy of the subject matter; the many diagrams and half-tone illustrations, and particularly the radiograms, are beautifully printed. Delicate detail, such as the lesions of miliary tuberculosis of the lungs, can only be well shown in actual photographic prints, and the use made of this form of reproduction in place of half-tone blocks is an instance of the extreme care taken over details. The radiologist, faced by bookshelves overflowing with periodicals, requires some courage to commence a new series; yet this annual is worthy of a permanent place in his library, and one who has studied these two volumes will look forward with keen interest to the appearance of others. He should order his volumes *bound*. The prices quoted above are for paper covers, which do not even outlast the curiosity of the reviewer. Cloth bindings cost only a few shillings more. (Price bound, Vol. I., M.48.6; Vol. II., M.57.)

EXTENSION OF WEST SUFFOLK HOSPITAL.—Mr. E. L. D. Lake, chairman of the reconstruction committee of this institution at Bury St. Edmunds, has laid the foundation-stone of a new out-patients' department. It is intended shortly to add a new women's ward and increase the accommodation for paying patients.

THE LANCET.

LONDON: SATURDAY, OCTOBER 20, 1928.

ANALYSIS OF LIFE.

As Sir FREDERICK HOPKINS reminded the Biochemical Society the other day, WÖHLER effected the first synthesis of an organic compound when he made urea in 1828. That finally disposed of the idea that live animals owed their obvious peculiarities to a chemical composition which could not be imitated in the dead world. In the succeeding 100 years the artistry of organic chemists has added one triumph to another—sugars, adrenalin, thyroxin, amino-acids, and polypeptides—and if nothing quite like a native protein has yet been made artificially it is not unjustifiable confidence to believe that someone will do it sooner or later. Particularly striking perhaps is the demonstration which has been given by Prof. E. C. C. BALY and his colleagues at Liverpool that formaldehyde and sugars can be formed from CO_2 and water on the surface of coloured inorganic substances such as nickel carbonate under the influence of light. There seems to be no reason to doubt that the chemical reconstruction of the substance of an animal or a plant is easily within the range of possible achievement.

Parallel with this chemical advance we have the development of the microscope and conspicuous progress in physical chemistry, especially in that branch of it which deals with the properties of the masses of matter—larger than simple molecules and too small to be clearly visible—which we call colloids. A great deal has been found out about the structure of live organisms and many of the strange things which happen in the body have been explained by processes of microphysics which can be reproduced outside the body. The imitation is certainly less complete than has been achieved in chemistry, and the hopes that the microscope would ultimately be made to magnify so much that it would show us life going on have been dashed by the realisation that the possibilities of the instrument in anything like its present form are necessarily strictly limited and that we cannot expect to see things which are less than a certain size. The physics of colloidal particles, surfaces, and membranes have suggested a number of explanations of "vital" phenomena, but whether the cells of the body actually do so work seems to be very hard to demonstrate. Those who wish to make a structural model of a cell or of a fibril of striped muscle or of a secreting gland are in the position of a chemist who was limited to single molecules; the pattern which they are copying is too small to investigate. However, it is possible that these difficulties may be overcome, and that the anatomy of the cell will be as completely reproduced as its chemistry.

When this has been done, will the product be alive? At the moment no one can predict the answer. On the whole it is probably fair to say that while chemistry, physics, and the microscope have helped us enormously to understand the mechanisms by which animals and plants carry on their activities, they have done little or nothing to explain life. There are plainly a good many qualities and possibilities which would have to be added to a perfect model of an organism before it would live; what we cannot tell is whether or no these qualities would appear spontaneously in the artificial construction, whether, that is, they are inherent in its structure and composition. There are the interrelationships of one part of the body with another, the dependence of the organism on its environment, the exact relation between structure and function which necessitates continual activity—different thinkers attach varying importance to these apparent differences between the live world and the dead, and our readers will find much that is of interest in the sober version of Prof. F. G. DONNAN's discourse at Glasgow, which is printed in *Nature* for Oct. 6th. But what strikes many people who have taken part in the discussion is that there is something more in an animal than a collection of mechanisms, and that if Prof. A. V. HILL explains the intimate details of cellular oxidation he will not necessarily reveal the secret of life. It has seemed to them characteristic of life that it should have a purposive appearance, and that while it uses the mechanisms which have been explained and many others which await dissection it is not their servant but their master. ROUX, from his discipline of functional anatomy, derived the conclusion that an animal is dominated by the end it is aiming at rather than the means which it uses to reach it, and medicine affords daily examples of the truth that if you obstruct or prevent the body doing something by its customary method it will do its best to do it by some other means. Among the higher animals, for instance, reproduction is so commonly sexual that such a method can be called the almost invariable rule. It is evidently convenient and effective. But it is not quite universal. Parthenogenesis is found as an odd and occasional occurrence as high in the animal scale as insects and molluscs, and it can be artificially induced in vertebrates; a form of budding in the larval stage occurs in certain insects and some armadillos regularly produce several young from a single egg; hermaphrodite animals generally prefer cross-fertilisation, but they will self-fertilise if congress is prevented. The mechanism of reproduction is therefore variable and its essence is not the union of an egg and spermatozoon, but the production of fresh individuals; the routes are different, the destination the same, and it is difficult to see how a satisfactory model could be made of this.

It may be, too, that in trying to define the essential distinctions between live and dead things we have made too much of their differences and not enough of their similarities, and that in thinking about the mystery of life we have overlooked the mysteries of the inorganic world. Two views are obviously possible: first, that live organisms can be sharply separated from the rest of the world as a class by themselves; secondly, that the whole universe is constituted of units which in many ways resemble one another, and range from atoms at one end to man and the spiritual world at the other. As Prof. A. E. BOYCOTT pointed out to the Pathological Section of the Royal Society of Medicine this week, the modern revision of our ideas about the structure of matter has certainly tended to assimilate the behaviour of atoms and molecules to that of live organisms. Instead of being fixed, permanent, and ultimate, we believe now that atoms have a highly complex structure, that they are subject to evolutionary changes, and that in the stars and in space they go through a cycle of destruction and reproduction not altogether unlike the life and death of animals. The old simplicity of the atom is gone, and its structure and behaviour are as mysterious as what we call life. If this is the right way of looking at the world, no solution of the problem of life is to be had by showing

it to be compounded of physics and chemistry. We get no further than a realisation that live and dead things are all related to one another much in the same way as the different members of the animal kingdom. Yet it is some advance to reach this point, especially to those who are content to leave philosophy alone and ask only for some satisfying basis on which they can pursue their examination of that part of the world which happens to interest them. There is much wisdom in Prof. LOVATT EVANS's advice to the physiologists at the British Association at Glasgow—that they should give up the hopeless attempt to know what life is, and should take it as it stands and study its manifestations, regarding the adaptation of organisms to their environments as the basal principle from which they start. And it would certainly be a relief to get quit of the endless controversy between vitalism and mechanism and be rid of the mysticism of vitalistic interpretations and the superficiality of mechanistic explanations. If we will agree that live things and dead things have more points of resemblance than of difference, we can end the discussion with the happy conviction that both parties have been right.

CARDIAC STIMULANTS.

CIRCULATORY failure may be startling in its onset, and as it is often fatal it always causes anxiety. The medical man in attendance feels that something must be done at once, and his natural tendency is to administer some drug which has a reputation as a cardiac stimulant, without giving very much consideration to the causes underlying the failure or the way in which the drug is likely to modify them. If the patient recovers, credit is given—perhaps quite wrongly—to the medicament; if the end is fatal, at least something in the way of active treatment has been tried. This is unsatisfactory, if only because it confuses opinion among clinicians about the relative efficacy of the so-called stimulants of the heart. Nor has the situation been made much clearer by the efforts of pharmacologists, who have, in fact, sometimes added to the difficulties of the subject by prematurely transferring the results of their experiments to practical therapeutics. To escape from this position, Prof. J. A. GUNN, in his presidential address to the Section of Therapeutics of the Royal Society of Medicine last week, suggested [1] as the first essential a better classification of cases of circulatory collapse. He would banish the term "cardiac failure" and substitute "paralysis of heart muscle," or "paralysis of vasomotor centre" or "paralysis of capillaries," according to the nature of the primary trouble. Though no one is likely to dispute the wisdom of this suggestion, the solution is not so easy as it may appear, for adjustment of the circulation involves complex correlations of the heart and vessels through central and peripheral mechanisms, and the analysis and interpretation of the phenomena of circulatory failure are difficult and elusive, because several factors are usually involved. Nevertheless we can determine along these lines the main features of some of the forms of circulatory failure, and settle in some degree the therapeutic requirements of each.

For failure arising from auricular fibrillation or some other disordered function of the heart everyone agrees that digitalis and its allies are useful, strophanthin being given intramuscularly or intravenously when a rapid effect is wanted. Apart from this group, failure appears as an urgent symptom, generally because the patient is suffering from acute or chronic disease, from a poison such as the general anæsthetics, or from the shock of injury. In these cases there is little reason for attributing it to the condition of the heart, since all the evidence goes to show that the fault lies chiefly with the central vasomotor control and the peripheral circulation—the arterioles and capillaries. If these could be induced to regain their tone the heart would be competent to carry on its work, so there is little to be gained here—and perhaps a great deal to be lost—by the indiscriminate injection of active cardiac glucosides. Rather should we turn to the other parts of the circulatory mechanism and consider how they can be affected. The vasomotor centre can be stimulated reflexly by local irritation varying in degree from the comparatively slight stimulus of a mouthful of spirit to the more powerful shock produced by the subcutaneous injection of alcohol or ether. Its excitability, as well as that of the closely allied respiratory centre, can sometimes—though not to any great extent—be enhanced directly by drugs such as strychnine and caffeine. The arterioles and capillaries can be made to contract by the direct action of pituitary extract and adrenalin, with consequent increase of blood pressure. We thus seem to have remedies suited to any situation, provided we can choose the drug appropriate to the type of failure, and provided the vaso-motor centre is not completely paralysed, nor the vessel walls completely lacking in excitability.

The circulatory failure resulting from poisoning of nearly every kind is commonly associated with respiratory failure. Here the danger lies in depression of the vital centres in the medulla, and the proper treatment is to give large hypodermic doses of alcohol, ether, or strychnine, together with artificial respiration. Exactly similar is a sudden collapse in the course of an acute or chronic illness. Except in angina pectoris, where the dilator effect of amyl nitrite is required to ensure better nutrition of the myocardium, there is the same need for stimulating the vaso-motor centre, or, if it is paralysed and does not react, for increasing the tone of the muscles of the arterioles, as can be done with pituitary extract. Whether adrenalin should be employed in either of those conditions is a question of some difficulty. Undoubtedly it can raise blood pressure and accelerate the heart, but it acts best when given intravenously, and the least over-dosage may throw too heavy a strain on the heart and vessels. Besides, its action is transitory. Adrenalin is therefore reserved, as a rule, for cases of complete or threatened cardiac arrest, and it is customary to give intravenously or by intracardiac injection not more than 0·2 c.cm. of the liquor, well diluted. The drug should not be used in the early stages of chloroform anæsthesia because it may produce ventricular fibrillation, but this mishap does not occur in the later stages. In primary shock after accident there is no sense in giving remedies which will increase the exhaustion of the vaso-motor centre; this exhaustion is itself due to excessive stimulation of sensory nerves. Nor indeed is it necessary to give any drug at all, for primary shock is seldom dangerous to life; warmth and artificial respiration will aid recovery. Secondary shock is much more serious, but drugs acting either centrally or peripherally on the circulation are of no avail in its treatment, as is only to be expected, since the underlying change in shock is the diminution in the volume of the circulating blood consequent upon the loss of blood plasma through the capillary walls. In such circumstances it is rational to increase the blood

[1] See THE LANCET, Oct. 13th, p. 758.

volume by liberal administration of fluids by the mouth, warm saline by the rectum, or, if necessary, by intravenous injection of gum saline or whole blood.

So far, in what may be described as emergency therapeutics, the position is fairly clear, but difficulties at once arise in considering the treatment of that ingravescent form of circulatory failure which often accompanies acute febrile disturbances, and which is, in fact, the usual terminal event in fatal infectious disease. Should digitalis be given at all, and, if so, should it be given early or late? These are questions easier to ask than to answer, but it may safely be inferred that where the efficacy of digitalis is in such doubt, its value cannot be very great. There is a body of clinical opinion which maintains the efficacy of digitalis in such diseases as pneumonia; on the other hand, experiments have shown that in acute pneumococcal infections in animals, the associated fall in blood pressure is a result of cardiac failure. Even when the pressure has fallen very low, clamping of the aorta still causes it to rise again sharply. If it is permissible to transfer to human beings the obvious deduction from this experiment—namely, that the heart is still capable of supporting a high blood pressure, and that the real cause of the circulatory failure is some central or peripheral change—there is no place for digitalis in the treatment of fevers. It will be more reasonable to try to keep the respiratory and vasomotor centres active by giving drugs such as strychnine, weak though their action may be, and to employ pituitary extract and adrenalin as adjuvants in emergency. These are subjects which need more extensive discussion; meanwhile it is clear that Prof. GUNN is right in saying that a clearer conception of the underlying basis of circulatory failure and a better classification of its varieties would greatly improve therapeutic practice.

GENERAL MEDICAL COUNCIL ELECTION.

THIS week-end voting papers will be issued by the Registrar of the General Medical Council in connexion with the election of Direct Representatives of the registered medical practitioners in England and Wales. There are two vacancies to be filled owing to the death of Dr. J. A. MACDONALD, of Taunton, and the resignation of Sir ROBERT BOLAM on his appointment as Representative of the University of Durham on the Council. For these two vacancies there are four candidates, two of whom were officially endorsed by the members of the British Medical Association at their Cardiff meeting, and two who are standing as Reform Candidates under the ægis of the Medical Practitioners' Union. We print on another page the election addresses issued by these candidates. Dr. J. W. BONE and Dr. E. K. LE FLEMING remark that at the present time only two of the members of the Council are general medical practitioners. They are themselves both in the active pursuit of medicine, with the added qualification of having had much experience of administration and medico-political work. Dr. BONE has carried on private and contract practice for 32 years in the industrial area of Luton. Dr. LE FLEMING has seen similar service for 27 years in the rural area of Wimborne. Both feel that the educational outlook of the Council has in the past been somewhat that of the teacher, and they propose to introduce a further leaven of members engaged in family practice to assist the Council in preparing the medical student for a career which in the great bulk of cases is that of a general practitioner. The penal procedure which occupies so much of the Council's time turns on situations which arise in the lives of general practitioners. Dr. GREGG and Dr. WARD find the General Medical Council somewhat ill-adapted to modern conditions. They see evidence of defects in three directions—namely, the small representation of the public, the scarcely greater representation of the general practitioner, and the difficult position of the Council in disciplinary matters. Both candidates have given many years of service in medical organisation and public work, and, if elected, they pledge themselves to initiate discussions which shall lead the Council to prepare a schedule of reforms for the approval of the State.

Direct Representatives hold office for a term of five years (when they are eligible for re-election), and accordingly it is not often that the medical profession as a whole is called upon to exercise its suffrage. The two sitting representatives for England, Sir JENNER VERRALL and Dr. H. B. BRACKENBURY, hold office until Jan. 1st, 1930, and the same is true of Sir NORMAN WALKER, who represents Scottish practitioners, and Dr. LEONARD KIDD, who is direct representative for Ireland. At the last election, held in the autumn of 1924, when there were eleven candidates for four seats, and voting was of a more complicated nature than it is this time, 562 practitioners rendered their votes invalid by disregarding the instructions on the paper. The total number of voting papers issued in 1924 was 29,179, of which only 607, or about 2 per cent., were returned as dead letters. This, as we then remarked, speaks for the high accuracy of the Medical Register. The election is quite properly used as a golden opportunity for still further enhancing this accuracy, and we call attention to the Registrar's request in our correspondence columns to the effect that any practitioner who does not receive a voting-paper during this week-end should communicate with the office of the Council in order to ascertain that his address is correctly registered.

CECIL HOUSES.

"THE need for accommodation for homeless women, who through no fault of their own are without permanent shelter, grows apace." This is the conclusion recorded in the first annual report published in connexion with the Cecil Houses, of which there are now three, two being in full working order, and the other to be opened at the end of the year. The aims and objects of the Women's Public Lodging-house Fund, which was inaugurated in 1926, largely owing to the enthusiasm of Mrs. Cecil Chesterton, are as follows: the fund seeks to provide suitable premises and to meet at cost price the acute need of clean beds, bathing, and washing accommodation for homeless or vagrant women. It has been established solely for the purpose of social service, and in no circumstances will any profit be made, but apart from redemption of capital expenditure each house is designed to become self-supporting. Cecil Houses are non-sectarian, and women applying for beds are not called upon to answer any questions about their past history or the reason why they have come to a common lodging-house. The first house, situated at 35, Devonshire-street, London, W.C. 1, has beds for 44 women and cots for two infants. The one at 47, Wharfdale-road, N. 1, has 60 beds and 10 cots, whereas the new house at 194, Kensal-road, W., will accommodate 65 women and 10 infants. For one shilling a night a woman can get a good bed, a hot bath, and facilities for washing her clothes. A minimum of £5000 is needed to found each house, and subscriptions and donations are urgently required.

Annotations.

"Ne quid nimis."

THE INCIDENCE OF EYE DISEASES.

AT the Royal Society of Medicine last week Mr. Cyril H. Walker inaugurated his term of office as President of the Ophthalmological Section by an address on Some Recent Changes in the Incidence of Ophthalmic Diseases. Several diseases of the eyes, he said, which used to be extremely common are now comparatively rare, at any rate in Bristol and the surrounding district. One of these was blepharitis of the lids in both the squamous and pustular varieties; another was phlyctenular disease of the conjunctiva and cornea. The diminution of blepharitis was no doubt due to the improvement in the cleanliness of children of the hospital class, and of phlyctenular disease to an improvement in their nutrition, due to the general raising of the level of wages since the war. Even more encouraging was the drop in the incidence of ophthalmia neonatorum. The percentage of children in a Bristol blind school who have lost their sight owing to this disease is not more than a quarter of what it was 50 years ago. In Bristol the number of cases notified fell from 137 in 1922 to 59 in 1927. This quite recent decrease is remarkable, and may perhaps be attributed to more efficient prophylaxis by midwives and the earlier treatment secured. In Bristol the routine use of silver nitrate for prophylaxis had been abandoned and a 1 per cent. solution of mercurochrome substituted. Syphilitic iritis was now becoming one of the uncommon affections of the eye, and lamellar cataract, associated with defective enamel of the teeth and rickets, was now seldom seen. Perhaps even more remarkable was the comparative rarity of cases of genuine primary acute glaucoma. Whether this was due to the fact that many cases which would formerly have been diagnosed as primary are now found to be secondary is a matter on which Mr. Walker did not express an opinion. The idea that it had anything to do with the indiscriminate use of atropine by the general practitioner in former days he rejected as a libel on his older colleagues in general practice.

All this is very encouraging and the question may be asked: Why, then, is the number of patients attending eye hospitals and eye departments as great or greater than it ever was before? The greater care which is now devoted to the correction of refractive errors is doubtless the principal reason, but not the sole one. There are some serious eye diseases which show no sign of diminution. Though acute primary glaucoma is rare, chronic glaucoma is as common as ever. Certain forms of cyclitis associated with keratitis punctata are even more common than formerly. Although cases of lamellar cataract are seldom seen, senile cataract still afflicts a certain proportion of the population over middle age, and so far as its pathology and prevention go, presents problems which are as yet completely unsolved.

SYPHILIS IN PARIS.

THE latest figures suggest that syphilis is on the increase in Paris. The venereal diseases dispensary at the Hôpital Saint Louis, which receives patients from all over Paris and the surrounding districts, reports that the number of cases, after having fallen regularly from 1920 to 1924, began to rise again in 1925, and since then has risen each year, the number of new cases registered in 1927 being almost exactly what it was in 1920. Various possible explanations for this state of affairs are discussed by Jeanselme and Burnier.[1] At one time, they point out, it was thought that the disease was being imported by immigrants, but it was found that 80 per cent. of the foreigners under treatment had become infected in France, and at present the proportion of immigrants under treatment is small. Undoubtedly a serious factor is that only a small proportion of infected women present themselves for treatment at the dispensaries. In 1927, out of 611 new cases of syphilis, 409 patients were men and 202 women. It is suggested that an intensive campaign should be undertaken among women and that better arrangements for privacy should be made in the dispensaries. Unfortunately it is only too common for patients to give up treatment as soon as the external signs of the disease have disappeared. Only about a third follow their treatment regularly, and more than half give it up after a few injections. Here social workers can be of great help; also the loss of time through attendance at the dispensary should be reduced to a minimum. Jeanselme and Burnier consider that many medical practitioners are not up to date in their methods of diagnosis and treatment, so that valuable time is lost at the onset of the disease, while the patient spreads infection. They urge that every medical student, without exception, should be obliged to take a course of training in a venereal diseases department, and that all dispensaries should be regarded as schools where practitioners may come to improve their technique. They believe that clandestine prostitution is considerably increasing in Paris, and that this is contributing to the endemic of syphilis. It will be remembered that France is one of the few remaining countries where State regulation of prostitution is still in force, but the number of women arrested for infringing the police regulations has regularly increased during the past five years.

[1] Bull. de l'Acad. de Méd., 1928, c., 749.

RECENT WORK ON SPRUE.

A DEFINITE and serious attempt has been made at the Haffkine Institute, Bombay, to unravel the mysteries of sprue. F. P. Mackie and his fellow workers have already published in the *Indian Journal of Medical Research* a series of papers on the biochemistry of this important and widespread disease, and now in conjunction with G. D. Chitre, he has once more tackled the vexed question of its exact relationship to yeasts. In a profusely illustrated study[1] they recount investigations showing that whilst the yeast fungus, known as *Monilia psilosis*, originally described by Ashford, can be found in 40 per cent. of cases of sprue in Bombay, an identical organism is present with equal frequency in other intestinal diseases as well as in healthy individuals and animals. The work they have done gives no support to the view that *M. psilosis* (so-called), or any other yeast-like organisms studied, has any causative relationship to sprue. Their study of the structure and life-history of intestinal yeasts leads them to think, moreover, that the value of the fermentative properties of these organisms as a basis of classification has been much over-estimated and that really the human intestinal yeasts are relatively few in species and are much more easily classified on broad lines into a few distinct types. The variability of strains on subculture is very great, and Mackie and Chitre urge that it is unscientific to create a large number of species on inconstant characters. The net result of their labour is wholly negative, but it has cleared the air for further investigation and has definitely brought to an end much work on the yeast theory of sprue which was unsound and required refutal. At the same time it has borne out the results of Manson-Bahr's research in Ceylon in 1912–14, which was published in a report to the London School of Tropical Medicine in 1915.[2] The conclusions reached at that time were that the yeast fungi found in sprue were indistinguishable from the thrush fungus (*M. albicans*) and that their exact

[1] Indian Medical Research Memoirs. No. 11. (Supplementary Series to the Indian Journal of Medical Research.) Yeasts and Sprue. By Lieut.-Colonel F. P. Mackie, I.M.S., and G. D. Chitre, B.M.S. Published for the Indian Research Fund Association by Thacker, Spink, and Co., Calcutta. Pp. 39. Price Rs.3. 12 annas, or 5s.

[2] A Report on Researches on Sprue in Ceylon. 1912–1914. mbridge University Press, 1915.

relationship to the disease was problematical. A definite stand was taken against the uncritical classification of these organisms by means of certain biochemical reactions.

For many years, almost since the first accurate description of the disease in 1881, it has been known that liver, in the form of liver soup, exerted a definite curative action in sprue, especially in advanced cases associated with a high degree of anæmia, and some results of treating the disease with liver extract have lately been described by B. K. Ashford,[3] whose name is well known on account of his work on the ætiology. Fourteen patients received in addition to the recognised sprue diet a daily dose of Lilly and Co.'s liver extract, No. 343. It was found that the anæmia of sprue responded in a remarkable manner. Those cases with a high colour-index and less than two million erythrocytes yielded a shower of reticulocytes unless the bone-marrow was absolutely exhausted; on the other hand, those cases with an erythrocyte percentage of more than 60 showed no appreciable response. This sudden eruption of reticulocytes produced by liver extract acts like an internal transfusion and within a couple of weeks is followed by a permanent rise in the erythrocytes and in the hæmoglobin.

CLINICAL EVIDENCE OF HYPERVITAMINOSIS WITH VITAMIN D.

ATTENTION was drawn in our columns on June 9th of this year to the work of A. Kreitmair and T. Moll, which is quoted by Dr. W. Pfannenstiel on p. 845 of our present issue, and indeed arose out of Pfannenstiel's own early observations on rabbits fed with various doses of irradiated ergosterol. Kreitmair and Moll showed that there is a danger of "hypervitaminosis" when irradiated ergosterol is administered in excess. Their work dealt only with animals, though with a variety of types, and did not include any observation of the condition in human beings; indeed, they expressed the opinion that it would be necessary for a man to consume a daily dose of 100 mg. of irradiated ergosterol in order that a deleterious effect should be produced, whereas the maximum dose ordinarily administered to a human being would be about 5 mg. The actual risk, however, appears to be less remote. A. F. Hess and J. M. Lewis [4] have been in the habit of using daily doses of from 2·5–5 mg. of irradiated ergosterol in the treatment of rickets in infants, and have found it remarkably effective in all cases, even including those in which cod-liver oil had failed. Besides X ray examination, they used as criteria of healing the percentage of calcium and of inorganic phosphate in the blood. Among a highly satisfactory series of cases there occurred a very few in which the treatment was too drastic. In four cases the inorganic phosphate was as high as 10·4 mg. per 100 c.cm., a value double the normal, but no clinical disturbance of any kind was apparent. In several the calcium of the blood rose above the normal, 17·6 mg. per 100 c.cm. being the highest value recorded; excessive calcification could also be seen in the X ray picture. In certain of these cases the dose of irradiated ergosterol had been much increased, but in others it was not greater than that normally given. Two infants showed untoward symptoms associated with the hypercalcæmia—notably loss of weight, with vomiting, fever, and marked drowsiness—a condition reminiscent of that which the authors had noticed when, in their first use of ultra-violet light in 1918, they had given excessive doses. Hess and Lewis discuss the means by which the result which they observed might have been brought about. They refer to J. B. Collip's [5] well-known production of a fatal hypercalcæmia in dogs by administration of an excess of parathyroid extract. They point out that in the dogs the serum calcium declined at once when the parathyroid extract was stopped, whereas in the infants, where the hypercalcæmia was caused by an excess of irradiated ergosterol, it persisted for 30 days after the treatment ceased. They say: "It seemed as if the irradiated ergosterol either was stored or stimulated the parathyroids or other glands which regulate calcium metabolism," and they incline to favour the latter view. The more general opinion (cf. I. Greenwald and J. Gross [6]) is that the hypercalcæmia induced by parathyroid excess is maintained not by increased absorption but by mobilisation from depôts within the body, and that it is accompanied by increased excretion and by excessive loss of calcium from the bones. Hess and Lewis state that they observed just the opposite condition, one of excessive deposition of calcium in the bones, indicating more probably a greatly heightened assimilation of calcium. The whole question of hypervitaminosis with vitamin D will have to be studied, since the results even of controlled experiments by different observers are not yet harmonious. R. E. Harvard and J. C. Hoyle,[7] for example, giving a daily dose of 8 mg. of irradiated ergosterol to a healthy adult for 21 days in the winter, could find no increase in the content of serum calcium or of inorganic phosphate either above the normal or above the value in the pre-experimental period. In any case the dosage of irradiated ergosterol recommended for free use in clinical medicine should be carefully considered in the light of all the observations so far recorded.

[3] Jour. Amer. Med. Assoc., July 28th, p. 242.
[4] A. F. Hess and J. M. Lewis: Jour. Amer. Med. Assoc., Sept. 15th, 1928, p. 783.
[5] J. B. Collip and E. P. Clark: Jour. Biol. Chem, 1925, xiv., 485.
[6] I. Greenwald and J. Gross: Jour. Biol. Chem., 1925, lxvi., 217.
[7] R. E. Harvard and J. C. Hoyle: Biochem. Jour., 1928, xxii., 713.

BACTERIOLOGY OF PUERPERAL INFECTION.

A NUMBER of investigations have been made into the vaginal flora of normal women and of cases of puerperal septicæmia, and most of them have incriminated the streptococcus—particularly the hæmolytic variety—as the chief cause of fever during the puerperium. The Obstetrical Research Committee of the Melbourne University recently authorised another investigation on these lines, to see whether local hygienic and climatic conditions had any influence on the bacterial flora. An abstract of the results has just been published in the ninth annual report of the Walter and Eliza Hall Institute of Research.[8] Among 50 morbid cases examined post-partum or post-abortum streptococci were found in 36 per cent., the non-hæmolytic strains being generally associated with milder degrees of illness. Gonococci, accompanied by a characteristic type of fever, were found in 8 per cent. Various other organisms appeared, but could not be related to any definite morbidity. Streptococci inhabited the vagina of 24 healthy pregnant women and only two of these had febrile puerperia, while six women in whom no streptococci were found had some degree of fever. Dr. Lucy Bryce concludes that the mere presence of streptococci does not account for puerperal fever, and that the biological properties of the organism in question constitute an important factor. Streptococci, staphylococci, diphtheroids, and coliform organisms were commonly found in the puerperal uterus of healthy patients, and the research workers could only fall back on some undefined increase in virulence to explain why morbidity occurred in some cases and not in others. This, after all, does not take us very far. The fluctuating relationship of virulence to resistance must always be a delicate balance, dependent on a host of processes—metabolic, endocrine, and psychological. While the bacteriologist will stress alterations in virulence, the clinician will speak of degrees of resistance and the epidemiologist will ponder "epidemic constitutions." It may be that the factors which make Mrs. A succumb to a chained coccus while Mrs. B harbours the same organism without hurt will always remain incalculable. Twenty years ago we were happy in

[8] Melbourne: J. C. Stephens, Ltd., 1928; see also Med. Jour. of Australia, March 3rd, June 30th, and July 28th, 1928.

believing that the entry of certain organisms into any body produced inevitably certain specific diseases. That simple explanation is being slowly unlearned, and complex problems like that of maternal morbidity serve as useful though humiliating reminders that the reactions of the human organism can never be discounted, however "virulent" the invader of its peace.

REGIONAL ANÆSTHESIA IN DENTAL OPERATIONS.

ONE of the most striking advances in dentistry during the last decade has been the development of local anæsthesia; in this respect, dentistry is considerably in advance of surgery as far as this country is concerned. The technique of local anæsthesia has now reached such a pitch of perfection that it provides an invaluable and indispensable aid to the dentist in carrying out the extraction of teeth without pain. At first the method employed was that of a simple infiltration of the gum round the tooth to be extracted, but though this is often efficient it frequently fails, and the method of regional anæsthesia was introduced by which a nerve is blocked at some distance from the tooth to be extracted. In the mandible, where the bone is dense and the anæsthetic cannot easily reach the tooth, regional anæsthesia is especially useful. A still further development of local anæsthesia has been its employment to produce insensibility during the procedure of filling teeth. Since the realisation of so-called painless dentistry is much to be desired, this aspect of local anæsthesia is of considerable importance from the patient's point of view. A serious defect in the use of regional anæsthesia in the mandible for filling operations is the fact that, while the anæsthesia produced may be sufficient to allow the tooth to be extracted without pain, the pulp oftens remains sensitive and the anæsthesia therefore fails in its object of allowing a cavity to be cut out without pain. The paper by Dr. D. Stewart and Mr. S. L. Wilson, which appears in our present issue, offers a reasonable explanation of this phenomonen and suggests a way whereby regional anæsthesia in the mandible may be made effective both for extraction and conservative operations. They have shown that the pulps of the mandibular teeth receive their nerve-supply not only from the inferior dental nerve, but also from the lingual and the long buccal nerve. If these two nerves are effectively blocked, sensation in the pulp is completely abolished. Another interesting point brought out in this investigation is that the mandibular nerve does not end at the mid-line but crosses to the opposite side, to invade the region which should be sensitised by the nerve on that side. This overlap of sensation may extend as far as the lateral incisor on the opposite side. Whether from the viewpoint of anatomy or of dental surgery, this work from the Manchester Dental School is of interest, quite apart from its value to the patient in ridding him more comoletely of his fear for the dentist's chair.

THE TREATMENT OF LUPUS ERYTHEMATOSUS.

MOST dermatologists now regard the gold treatment of lupus erythematosus as the best so far devised, whether the underlying cause be accepted as tuberculous or septic. Dr. J. Malkin,[1] of Leningrad, reports that he has used the preparation called krysolgan in 62 cases, and it is interesting to learn that in none of them was a maximum dose of 0·05 g. exceeded at any one attendance. The total weight of the drug, which was administered intravenously in 1 per cent. aqueous solution, averaged between 0·15 and 0·2 g. for the whole course of 10 to 12 weekly injections. As a rule two such courses were given, and the injections were stopped for a time if there was any sign of intolerance, such as albuminuria, fever, headache, palpitation, or dermatitis. Malkin has divided his cases into three clinical categories:—

Group I. (15 cases).—Erythematous types, mostly on the face, with localised bright red to cyanotic discreet patches of various sizes, in which scales were few and only loosely attached. The scars after involution were very delicate and almost invisible, and it was in these cases that exacerbation was most marked when it did occur, which was very rarely.

Group II. (27 cases).— Discoid, infiltrated, scaly "butterfly" type, often with depressed centre and raised circumference. These cases left much more obvious scars than those of type 1.

Group III. (20 cases).—Diffuse, infiltrated, often confluent patches of irregular contour with intervening bands of scar tissue. The cicatrices left after involution resembled those in Group II.

No less than 24 patients, mostly in Group II., are said to have been discharged completely cured of their irksome disability, 25 were greatly improved, and 11 improved to some extent. Attention is drawn to the fact that some of the patients whose cure was incomplete had not finished their full course. If these results are confirmed the outlook is very encouraging, for they are better than any hitherto published. But it is surprising that they should have been obtained with the doses stated, since these are much smaller, as far as we know, than the smallest which other workers have used successfully.

[1] Dermat. Woch., 1928, lxxxvi., 852.

HEALTH IN ICELAND.

THERE is some interest in the health experience of an island community of 100,000 persons leading so sequestered a life as in the case with Iceland. Although somewhat bigger than Ireland only the lowland coastal area, about one-fourteenth of the whole island, is habitable. The report[1] before us deals with the year 1926 and is printed in Danish with an English summary. In this year the marriage-rate was 6·1, the birth-rate 26·1, the death-rate 11·1, the infant mortality-rate 49·3, and the natural increase of the population for the year 1647 persons. There were three outbreaks of enteric fever all traced to milk which caused 175 cases and 13 deaths. The outbreaks were overcome by isolation and preventive vaccination, but the danger of a repetition, it is pointed out, exists as long as the milk is not pasteurised. Seventy-one cases of diphtheria, mostly of a mild type, caused two deaths. Acute rheumatism was of a comparatively mild type and no deaths were attributed to it. All diseases are apparently notified and in 1926 there were 4799 cases of acute bronchial catarrh, presumably most frequent in the towns as the rural population do not apply for medical aid against it. There is usually an epidemic wave of catarrh beginning in October, reaching its maximum in February and its trough in June to September. The outbreaks often coincide with the immigration of labourers, fishermen, and scholars. In the Westman Islands it is noted that the immigrant fishermen are more susceptible and catch catarrh first and then infect the resident population. The death-rate from pneumonia is much the same as in this country, about 1 per 1000, but the death-rate from bronchitis was only 0·09. One of the remarkable incidents of the year was an outbreak of epidemic pleuritis, which gave rise to 431 cases with no deaths. This epidemic began in the capital Reykjavik in June and spread to about 20 districts in the latter half of the year. The disease lasted about one to one and a half weeks or longer, and in some cases the pleuritic pain was very severe. It has been suggested that the disease is caused by insects, but others consider it to be a modification of influenza. There have been several small outbreaks of it since 1911. Both measles and German measles have been recently imported, and it is noted that the efforts to prevent the spread only had the effect of causing protracted epidemics which lasted about two years in each case. There were 3115 cases of influenza regis-

[1] Reykjavik, Fjelagsprentsmidjan.

tered, as against 941 in the previous year. Most people who had influenza in 1925 escaped it in 1926. Venereal diseases are chiefly limited to the few towns in active communication with foreign countries. Thirty-two cases of syphilis were notified, 14 being foreigners, and there were 236 notifications of gonorrhœa, 41 being of foreigners. Both these figures are about the average of recent years. The death-rate from tuberculosis is very high, about 2 per 1000, and shows no tendency to decline, and in these respects the experience of Iceland resembles that of the Shetland Isles. Tuberculosis of the lungs is more frequent in women than in men, and about 20 per cent. of the tubercle deaths were due to the meningeal form of the disease. There were 12 deaths attributed to hydatid disease. The number of lepers decreases. In 1921 there were 63, and in 1926 49, of whom 36 are in the hospital. In 1926 there were only four deaths from child-bearing registered, a rate of 1·5 per 1000 births. The medical men in the island number 1 per 1000 and the midwives 2 per 1000 of the population. There are 6 hospital beds per 1000 of the inhabitants and one antituberculosis dispensary at Reykjavik. The university laboratory has been supplied with a new equipment for bacteriology and serology. In spite of lively building activity there is a considerable shortage of houses, especially in the towns. During recent years electric heating and lighting has been installed in several forms, small waterfalls being the source of power. In one of the most isolated rural districts nearly every farm has electric heating and lighting, a great deal of the machinery, including the turbines, being made by resident craftsmen. Vaccination has been legally enforced since 1910. In 1926 3060 children were vaccinated for the first time and 2215, aged 12 to 13, were revaccinated. Medical inspection of schools is obligatory and regulations to secure uniformity have just been introduced.

THE SURGEON AND HIS INSTRUMENT-MAKER.

WHEREAS it was only comparatively lately that the physician gave up the preparation of his own drugs, the surgeon has always had to rely on his instrument-maker. The craft is not one that comes within his scope, and doubtless from the earliest times he has gone to his cutler, described his requirements as nearly as he could, and returned to his surgery knowing that his idea would be faithfully executed, probably better than he conceived it. Mr. H. S. Souttar, replying to the toast of The Guests at the annual dinner of the Surgical Instrument Manufacturers' Association on Oct. 12th, told many truths that ought to be more widely recognised. Although surgeons now fully realise what they owe to the surgical instrument-makers, they have taken a long time to do so, and Mr. Souttar thinks that students even nowadays knew very little about the tools on which they depend so implicitly. One of the most paralysing tasks of the examiner in surgery is imposed, he said, when the surgeon hands a candidate an instrument and asks him what it is. More often than not the reply is heartbreaking. He finds that students take infinitely more interest in an operation if they are made responsible for the instruments, and when at a demonstration of artificial limbs they are unable to tell which leg the patient has lost, they are apt to conceive a profound respect for the maker of the substitute. Although Mr. Souttar, as a keen surgeon, may slightly underrate the trouble to which examination candidates go, at many schools, to learn the names and use of instruments which they will probably never see again, he is certainly right in maintaining that the indebtedness of the surgeon to the manufacturer is great and growing. The complexity of modern instruments, due largely to the inventiveness of surgeons, throws a strain upon the maker's skill and patience, but his courtesy and helpfulness do not fail. It is, moreover, satisfactory to know that British instrument-makers can more than hold their own, and that instruments hailed as novelties abroad are usually obtainable both better and cheaper in London or Edinburgh.

THE annual conference of representatives of local medical and panel committees will begin at 10 A.M. on Thursday, Oct. 25th, at the House of the British Medical Association, Tavistock-square, London, W.C.

THE Bradshaw Lecture of the Royal College of Physicians of London will be given at the College at 5 P.M. on Thursday, Nov. 1st, by Dr. A. G. Gibson, whose subject will be Pyelitis and Pyelonephritis. Dr. G. F. Still will deliver the FitzPatrick Lectures, on the History of Pædiatrics to the End of the XVIth Century, at the same hour and place, on Tuesday, Nov. 6th, and Thursday, the 8th. Members of the medical profession will be admitted on presentation of a card.

THE Bradshaw Lecture of the Royal College of Surgeons of England will be delivered in the theatre of the College in Lincoln's Inn-fields by Mr. C. H. Fagge on Thursday, Nov. 8th, at 5 P.M. The subject will be Axial Rotation, Purposeful and Pathological. Fellows and Members of the College are invited to attend, whilst students and others who are not Fellows or Members of the College will be admitted on presenting their private visiting cards.

THE fifth meeting of the International Congress of Military Medicine and Pharmacy will be held in London in May, 1929, under the patronage of H.M. the King. The subjects to be discussed include: the evacuation of sick and wounded by water and by air; tropical fevers of short duration; wounds of blood-vessels and their sequelæ; the physical and chemical analysis of the glass and rubber articles employed by the medical services; and the standard of dental and physical fitness in the various military services. All medical officers, dental surgeons, and pharmacists belonging to, or having belonged to, the forces of all nations admitted to membership of the League of Nations are invited to the Congress, and also all officers belonging to organisations in association with the medical services. The chairman of the organising committee is Lieut.-General Sir Matthew Fell, Director-General of the Army Medical Services, and the secretary is Major A. D. Stirling, R.A.M.C., who may be addressed at the War Office, Whitehall, London, S.W. 1. Those who intend to be present should inform the secretary as early as possible before Jan. 1st, 1929, and at the latest by Feb. 1st. The railway companies in Great Britain and Ireland have agreed to issue tickets at reduced fares to members of the Congress between May 4th and 13th.

QUEEN MARY'S HOSPITAL FOR CHILDREN.—The scheme under which 350 additional beds are to be provided at Queen Mary's Hospital for Children, Carshalton, for the treatment of London children suffering from rheumatic diseases has been approved by the Ministry of Health. The Metropolitan Asylums Board propose to increase the accommodation for patients and resident nursing staff by the erection of new blocks for the staff, which will eventually number 570, of two new ward blocks for patients, and a new chapel, thus releasing the ward which has hitherto been used for this purpose to its proper function. In the nurses' home a wash basin will be fitted in every room, and electric lifts will be provided in each of the four blocks. The patients to be admitted to the new beds are children of both sexes under 16 years of age who are suffering from (*a*) subacute rheumatism, (*b*) the later stages of acute rheumatism, (*c*) rheumatic chorea, or (*d*) rheumatic carditis.

MEDICAL GOLFING SOCIETY.—The autumn meeting of this society was held at Princes Golf Club, Sandwich, on Oct. 13th and 14th. The results were as follows:—Singles and Bogey (for Dr. Bathurst's prize): 1st, T. A. Torrance, 2 up; 2nd, N. C. Carver, after a tie at 2 up each. Foursomes and Bogey: 1st, N. C. Carver and G. T. Hebert, after a tie with T. A. Torrance and Sir Kenneth Goadby, each couple being 2 down. Canny Ryall Cup: 1st, J. D. Gray, 92 − 16 = 76; 2nd, A. Gallitty, 82 − 5 = 77; 3rd, Yorke Davies, 96 − 18 = 78; 4th, Rolf Creasy, 91 − 12 = 79, D. F. A. Neilson, 88 − 9 = 79, and F. A. Woodhouse, 86 − 7 = 79.

The Clinical Interpretation of Aids to Diagnosis.

A Series of Special Articles contributed by Invitation.

VIII.

THE SIGNIFICANCE OF HEARING TESTS.

By HAROLD BARWELL, F.R.C.S. Eng.,
CONSULTING SURGEON, DISEASES OF THE THROAT AND EAR, ST. GEORGE'S HOSPITAL.

IT must be admitted that the tests of acuity of hearing, as they can ordinarily be applied in the otologist's consulting-room, are necessarily rough and inexact, as compared, for instance, with tests of visual acuity. There is no accurately defined normal of hearing power which can be taken as a starting-point; perfect acuity of hearing is considerably greater than is required in ordinary civilised life, and very many people whose hearing falls short of this high standard are unaware of any disability, and must for all practical purposes be considered to have normal hearing. In recent years an electrically operated instrument, the audiometer, has been introduced in America, especially by Dr. W. F. Dean and Dr. E. P. Fowler, by means of which any tone from 64 to 16,000 double vibrations per second can be produced at any desired strength or amplitude, so that the minimum audibility for every tone may be found for either ear and plotted on a chart. This, although a valuable instrument from which much is expected in research, is not at present in regular use in the consulting-room. Even with this apparatus the precision of the results must largely depend on the intelligence and accuracy of the patient, and this is true in a greater degree of the tests ordinarily applied. The intensity of the sounds usually employed in testing are extremely variable; moreover, audibility varies with the acoustic properties of the room or even with the weather, and is greatly altered by the presence of any extraneous sounds, so that it is not surprising that clinical tests fall very far short of scientific accuracy. But in practice they are sufficient for diagnosis in the light of our present limited knowledge of otology.

Tests of Acuity.

Tests of hearing are partly quantitative, or tests of acuity, and partly qualitative tests designed to distinguish different varieties of deafness. Of the tests of acuity the spoken word is the most valuable, for the deaf patient desires improvement in the hearing for speech rather than for any kind of clicks or musical tones. It is noticeable that the hearing for speech does not necessarily correspond in degree to that for simple sounds, some patients hearing speech better than the watch or acoumeter, and some, unfortunately, worse.

The Voice.—In testing the hearing for speech the "conversational" voice is employed, and the volume of sound can be made more uniform if the lungs be first emptied of air by a deep expiration. The patient is seated with the ear to be tested turned towards the examiner, and the other ear closed by the moistened little finger in the meatus, or by inserting a plug of damp cotton-wool and pressing the tragus over it. The patient is asked to repeat what he hears while the examiner stands at the far end of the room, speaks in a uniform tone and gradually approaches until the words are heard correctly. It is best to use simple words and numerals, and to avoid the sibilant consonants, which carry a long distance. For very deaf patients "loud" speech must be employed, uttered with the lungs expanded, but it is very much more difficult to keep the loudness uniform.

For patients who are not extremely deaf it is better to test with the whisper, a quiet or gentle whisper being employed rather than the forced or "stage" whisper. This can be more easily kept constant than the voice and is more suitable in a consulting-room of ordinary size. The test is carried out in the same way as with the conversational voice. The normal distance for hearing the tests varies enormously with the conditions, as is shown by the fact that one authority gives the normal for the voice at about 20 to 30 ft., and for the whisper at 20 ft., whereas another states that whispered speech can normally be heard at a distance of 22 to 27 yards.

The *watch* is even less accurate as an instrument for estimating the degree of deafness, for the loudness of the tick varies enormously in different watches. The tick becomes weaker as the watch runs down, and it should therefore always be wound up just before testing. The note of the tick is a more or less musical one and of a rather high pitch, and is therefore relatively less well heard in cases of nerve-deafness with loss of hearing for high tones. In spite of these drawbacks it is much used, for it is a most convenient method of testing moderate degrees of deafness in a room of average size, and is particularly useful for measuring improvement after such treatment as inflation. The watch should always be taken out of reach and approached to the ear until it is heard, the eyes of the patient being closed; if two or three trials be made and the patient always signifies that he hears it at the same point it is certain that he is answering accurately. The "normal" distance for the particular watch should be ascertained beforehand, and should always be given in reports on the hearing; this is usually expressed as a fraction—e.g., W. $\frac{12}{60}$, which implies that a watch normally audible at 60 in. is heard at only 12 in. from the ear.

The *acoumeter*, designed by Politzer, produces a click by means of a small hammer which falls by gravity from a constant height on to a bar. The sound so produced is nearly uniform and is less high-pitched and musical than that of most watches; it is also louder and can be heard by a "normal" ear for about 15 metres, or 50 ft., and is therefore not suitable for testing slight degrees of deafness in an ordinary room, but it is very useful in the examination of the more severe cases. Like the watch, it should be gradually approached to the ear to be examined, and the result expressed as a fraction of the normal—e.g., $\frac{4}{50}$ ft., but, as it is a standard instrument, the distance only is often given, in which case the normal distance of 50 ft. should be remembered.

Galton-Edelmann Whistle.—The extreme range of perception of tones for the human ear may be taken to be from 16 to 40,000 double vibrations a second, but the higher part of the scale is inaudible to many otherwise quite healthy ears, and the upper limit should not be considered pathological unless it falls below 16,000. The lower limit may be tested by tuning-forks, while the upper limit is usually examined by means of the Galton-Edelmann whistle, in which the wind is produced by a small rubber ball, and the pipe lengthened or shortened by an extension worked by a screw; a scale is attached and the reading taken at the upper limit of audibility. The scale is an arbitrary one, the smaller readings indicating the higher pitch; the normal limit is at about 0·4 to 1·0, it falls with advancing age, and is usually between 1·5 and 2·0 by the age of 60.

The *monochord*, in which the note is produced by a stretched steel wire, is more accurate, but more difficult to use. In both cases the opposite ear must be tightly plugged.

Tuning-fork tests are both quantitative and qualitative. As the length of time during which a fork sounds depends upon the force with which it is struck, it is useless to measure the time for which it is heard; but the loss of hearing for a particular note can be estimated with some degree of accuracy by measuring the length of time that it is heard by the normal (observer's) ear after it has ceased to be audible to the patient. The fork must be so designed and used as not to produce overtones, should be held at a uniform distance of about two inches from the ear, and with the prongs in a line with each other to the ear examined;

if it be held obliquely interference will diminish the intensity of the sound. This is the test of air-conduction (A.C.). A large range of forks is available for special purposes, but for clinical work three are sufficient—C^0 128 double vibrations (d.v.) a second, C^2 512 d.v., and C^4 2048 d.v. The deficiency of hearing in the ear being tested is expressed by such a formula as C^0–30, which implies that the normal observer hears the C^0 tuning-fork for 30 seconds after it has ceased to be audible to the ear under examination.

Bone Conduction Tests.—The hearing by bone-conduction (B.C.) is examined in a similar manner, the base or foot-plate of the fork being pressed firmly over the antrum of the ear examined and transferred to the same region of the observer's ear as soon as it ceases to be heard, and the result stated, as B.C. −20. If, however, it be not audible to the observer, it is next applied to his own mastoid first, and transferred to the patient's when no longer heard, the number of seconds of increased bone-conduction being noted—e.g., B.C. +15. If the examiner's and patient's results coincide this may be written as "(C^0) B.C. normal," or B.C. ±. The name of Schwabach is associated with this test, which is sometimes written "Schwabach −20," a quite unnecessary complication.

Qualitative Tests.

Weber's test is the comparison of the bone-conduction of the patient's two ears; the tuning-fork is placed on the middle line of the forehead or vertex, or on the upper teeth, and the patient asked in which ear it sounds more loudly. The result is entered "Weber to R," or to L., as the case may be. In the early stages of otosclerosis and in cases of acute catarrhal otitis with fluid in the tympanum, there is generally absolute increase of bone-conduction, and in unilateral cases Weber's test is strongly lateralised in the direction of the affected ear (see chart below).

Rinne's test is the comparison of the air-conduction with the bone-conduction of the ear under examination. The tuning-fork is first held to the meatus and transferred to the mastoid as soon as it ceases to be heard; if it be not audible there, the test is reversed by placing the fork on the mastoid first and, when the sound has faded away, to the meatus. Rinne's test is said to be positive when the fork is heard for a longer time by air- than by bone-conduction, and negative when heard on the mastoid after it has ceased to be audible at the meatus. The result may simply be written R. + or R. −, but it is more complete if the difference between the audibilities by the two paths be noted in seconds, as R. +15, or R. −10, and in accurate work the fork used for testing should be noted, as C^0 R. −10, for bone-conduction is relatively stronger with the lower tones, and Rinne's test may be negative with the C^0 fork, while still positive with the C^2 fork; it is rarely negative with C^4. If the audibility by the two paths is equal the result may be written R. ±.

Rinne's test is positive in the normal ear and also when deafness is caused by any lesion of the perceptive apparatus, either in the cochlea, the auditory nerve, or the brain. On the other hand, with any obstruction to the conduction of sound to the cochlea, bone-conduction is relatively, and sometimes absolutely, increased, with the result that Rinne's test tends to become negative. This happens whether the obstruction be in the middle ear or in the meatus, and may easily be shown experimentally in a normal person by blocking the meatus with the finger. As the test is positive in the healthy ear, it is obvious that it will remain positive in the slighter degrees of obstructive deafness, and only become negative when the deafness has reached a certain degree of intensity. It is usually very markedly negative in the earlier stages of otosclerosis, and in cases of acute catarrhal otitis with fluid in the tympanum. But in deafness of long standing, due to chronic "dry" catarrh or to otosclerosis, secondary degeneration of the cochlea occurs, bone-conduction becomes diminished, and Rinne's test may even be positive. In many cases too, the cochlea is affected irregularly, so that "islands" of relatively good hearing remain in various parts of the scale. Typically, the principal types of deafness show definite characteristics.

The following chart shows typical results in various conditions.

	Normal ear.	Abnormal ear.		
		Nerve-deafness.	Middle-ear deafness.	Oto-sclerosis.
Voice	40 ft.	5 ft.	3 ft.	2 ft.
Whisper ..	20 ft.	2 ft.	2 ft.	2 ft.
Watch	$\frac{60}{60}$	$\frac{2}{60}$	$\frac{12}{60}$	$\frac{12}{60}$
Acoumeter ..	50 ft.	4 ft.	4 ft.	4 ft.
Galton ..	0·5	4·2	0·5	0·5
A.C. C^0 ..	±	−10	−30	−60
A.C. C^4 ..	±	−30	−5	±
C^0 B.C. ..	±	−20	−5	+5
Rinne	+15	+20	−10	−50
Weber	..	to R.*	to L.	to L.

* It is here assumed that the right ear is the normal one.

Tests in Relation to the Nature of the Lesion.

In *nerve deafness*, which includes the deafness of old age, hearing is most diminished at the upper end of the scale, bone-conduction is very markedly lessened. Rinne's test is positive, and with Weber's test the fork is heard more loudly in the better ear; hearing is best in a quiet room, and is relatively better for the voice than for the watch; the drum and Eustachian tube are normal, and there is no improvement after inflation.

In *middle-ear deafness*, on the other hand, the hearing is better for high than for low tones, bone-conduction is relatively and often absolutely increased; Rinne's test is negative and Weber's is lateralised to the affected ear, the watch is heard better than conversation, and in some cases hearing is noticeably better in a noise, as in a railway carriage—a phenomenon termed "paracusis Willisii; the drum-membrane shows changes such as retraction and thickening, the Eustachian tube is variously obstructed, and inflation gives improvement.

Otosclerosis gives results similar to those of middle-ear deafness, but in the early stage the departure from the normal is very marked; there is very decided loss for low tones, bone-conduction is definitely increased, Rinne is strongly negative, and paracusis very noticeable to the patient; the drum shows little or no abnormality, the Eustachian tube is healthy, and inflation does not improve hearing. In the later stage of otosclerosis, when there is degeneration of the cochlea, the results of tests approximate to those of nerve-deafness, and in very advanced cases it may be impossible to distinguish the two by examination alone.

Conclusion.

The object of these tests is, of course, quantitatively to estimate the degree of deafness, so as to be able to measure improvement under treatment, or, on the other hand, the gradual deterioration of hearing with the progress of the disease; qualitatively the tests are used to assist in the diagnosis of the nature of the lesion producing the deafness. In some cases the results of testing are simple and straightforward, but in many they are anomalous. A diagnosis should only be made after taking other factors into account, such as the appearance of the drum-membrane, the condition of the Eustachian tubes, and the result of inflation.

BELFAST SAMARITAN HOSPITAL.—An extension of this hospital was opened on Friday in last week by Princess Mary, who expressed her appreciation of the additional provision now made for women patients.

WILLIAM MACKENZIE MEMORIAL MEDAL. — On Oct. 9th, at the Glasgow Eye Infirmary, Dr. A. Maitland Ramsay was presented with the first medal to be given under the recently created William Mackenzie Memorial Fund for original research in ophthalmology.

Special Articles.

THE INSTITUTES OF MEDICINE.*

BY J. J. R. MACLEOD, M.B., D.Sc., LL.D., F.R.S.,
REGIUS PROFESSOR OF PHYSIOLOGY IN THE UNIVERSITY OF ABERDEEN.

IT was not until about the middle of the nineteenth century, some 75 years ago, that the scope of medical science became so widened as soon to make it evident that laboratory courses other than those in anatomy should form part of the medical curriculum, and chemistry, chiefly inorganic, was the first to receive attention. But soon the necessity for courses in other subjects became apparent. The details of anatomical structure, revealed by the microscope, the relationship of micro-organisms to sepsis and infectious diseases, brought to light through the researches of Pasteur and Lister, the study of the circulation of the blood and of the functions of the muscles by application of the precise methods of physics, and the unravelling of the mysteries of digestion and nutrition by those of chemistry, demanded that provision be made to instruct the medical student in the principles of these sciences and to give him some practice in the use of the methods which they employ. New laboratory courses demanding much of the student's time have thus from time to time been added to the medical curriculum, until to-day it is overburdened with detail, ill-adjusted in the relationship of one course to another, and poorly designed to emphasise the importance of combining scientific reasoning with clinical experience.

These preliminary remarks may serve to indicate the scope of what I have chosen as the subject of my inaugural lecture. I am to venture to place before you what I believe should be the guiding principles underlying the plan of instruction in the science courses of the medical curriculum, and more especially in that group of subjects which, under the title of the Institutes of Medicine, or Physiology, comes under my immediate charge.

Aim of the Medical Course.

At the outset, then, let us consider the aims and purpose of the medical course. These are, in the first place, to make the student familiar with the already known principles of medical science, and to train him in the use of its most approved methods, and in the second to prepare his mind so that he may continue to be a student throughout his professional life and thereby be competent to add something which will be of value in the alleviation of human suffering. Every medical practitioner should have a certain familiarity with the methods of scientific research, and to gain this the medical student should be encouraged to approach the clinic with the viewpoint that each patient presents a problem susceptible to investigation by the methods of science. He will then soon find out in how far this method can assist him, and in how far he must fall back on experience, for it must ever be borne in mind that the practice of medicine is an art as well as a science. A knowledge of science must not be regarded merely as the foundation upon which an understanding of disease is to be erected, as something built in the past and hidden out of sight, with no other function than to serve as a support for the main structure of medical knowledge. It is much more than this; it enters into and is an integral part of the structure itself. It is its framework, into which all that is added must fit.

It is sometimes considered that research in medicine can be successfully pursued only by highly trained specialists provided with elaborate equipment and devoting all of their time to such work. Nothing could be more fallacious. On the contrary, the general practitioner is constantly face to face with research problems which he alone can solve. He is the only one who comes in contact with disease in its early stages, and it is here that close observation of symptoms and the critical study of the effects of treatment are much needed, indeed are essential, for the advancement of medical art and science. Prevention is better than cure, but how, it may be asked, can we prevent unless we know the true significance of the earliest symptoms. It is to the general practitioner that we must look for guidance here, and his competence to furnish it will be greatly enhanced if he be familiar with those same methods of thought which have enabled his colleagues in the clinic and the laboratory to achieve success in their more highly specialised and therefore more easily explored fields of research. The two groups must work hand in hand, which can be done provided only that each knows what the other is doing with regard to both problems and methods, and it is while he is in the medical school that the future practitioner must be made familiar with the methods of scientific research. This does not mean that the medical student should be required to undertake the investigation of some unsolved problem by himself, but it does mean that he should be shown in laboratory and lecture theatre how research work is done and how its methods can be used to advantage in bedside practice.

In placing emphasis on these aspects of medical education I am fully aware that there are but few who are possessed of those rare gifts, the inquiring habit of mind, and the urge to seek for new truths that are necessary for success in unmasking the closely guarded secrets of nature. But many even of those few who are in possession of those gifts will fail to develop them unless they be guided aright, and their classfellows will lose nothing, but rather will gain much, by being trained in principles rather than crammed with facts and details.

The problem of medical education therefore resolves itself into providing instruction so that the student, besides acquiring a working knowledge of the essential facts and principles that have been handed down through the experience of others, may also develop the faculty of self-education and become sensible of his responsibility to continue a student throughout his professional life. When we analyse the present-day curriculum in medicine we find that the training in science is practically confined to the first half of the course. It is not continued, except casually, through the clinical years, with the result that physiology and its allied subjects, and the sciences upon which they depend, have come to be regarded by many, not as the Institutes of Medicine, but merely as some sort of temporary scaffolding which can be torn down and cast aside without detriment to practice.

The Study of Animal Function.

Having spoken in a general way of what I consider to be the principles underlying the framing of the medical curriculum, let me now speak in detail of how I think these principles can be carried into effect in the courses in physiology. The greater part of this subject may be defined as the application of the known laws of physics and chemistry to the study of animal function. Familiarity with the main principles of these two sciences, as well as a knowledge of the structure of the body, is therefore essential before the study of physiology can be profitably pursued. This dependence of physiology on pure science becomes more and more evident as our knowledge expands, and it may not be out of place if I cite some examples from the experience of recent years in illustration. An understanding of the mechanism of the action of the heart has depended on developments in electricity. This has given us the electrocardiograph, by which the changes in electrical potential accompanying each heart beat can be recorded and measured, their significance studied, and the alterations in abnormal heart action understood. As a result of these researches the physician has been put in possession of

* Being an Inaugural Lecture (slightly abridged) as Regius Professor of Physiology at the University of Aberdeen, delivered on Oct. 9th, 1928.

methods by which he can determine with much greater precision than hitherto the extent of damage to the heart's action, and can follow more accurately the effects of treatment. The movements of the alimentary canal which are essential in the digestion of food have only recently come to be understood, through application of the X rays, and everyone is familiar now with the immense value which this knowledge has proved to be in the diagnosis of abdominal diseases. The marvellous influence of sunlight on growth and on the general well-being of animals has required for its discovery familiarity with the physics of light, and the great expansion of knowledge concerning the reaction of the blood and the regulation of breathing has depended on an understanding of the physical chemical laws of solutions.

These are only a few of the recent applications of physics in physiology and medicine; instead of multiplying them let me refer to some which chemistry has furnished. Dietetics has become elevated to the dignity of a science, through the discovery of the chemistry of the proximate principles of food, the proteins, the fats, and the carbohydrates, and the laws which govern growth and nutrition and energy production can now be investigated by accurate quantitative methods. It is as an outcome of researches in this field that we have come to learn of the importance of vitamins and of inorganic salts as factors in nutrition, and I need scarcely remind you that it was by close calculation and scientific adjustment of the dietetic requirements that it was possible during the war to maintain a tolerable state of health in beleaguered countries and communities. Scurvy has practically disappeared, beri-beri is becoming rare, and rickets should soon become practically unknown. It is to the chemist also that we must constantly look for guidance in unravelling the intricate series of changes by which the absorbed foodstuffs are prepared for utilisation by the organs and tissues. This is known as the metabolism of the body, and many of the diseases of adult life, such as diabetes and gout, have been shown to be due to disorganisation of the chemical processes upon which this metabolism depends. Without a knowledge of chemistry work in this field is impossible.

It is evident, therefore, that the course in physiology should be designed so as to show the student how the facts of physics and chemistry find their application in understanding animal function. He must be made familiar not only with what of importance has already been discovered, but also with the experimental methods by which the discoveries have been made. Merely showing him the finished picture is of little value compared with letting him see how it is painted, or better still, with giving him the opportunity to try to paint it for himself. If he learns something of the steps to be followed in investigating the mysteries of normal function he will be in a favourable position to make use of his knowledge of physiology when he comes to the bedside to study abnormal function.

Educational Value of Experiments.

Assuming, then, that the student is well grounded in biology, physics, and chemistry, what should be the nature and content of the course in physiology? At the very beginning provision must be made for allowing the student to perform experiments by himself. These should be carefully selected and organised for the purpose of illustrating the possibilities of the experimental method, rather than for yielding results that are in themselves of importance. A few well-selected experiments faithfully performed have a much greater value than many that are hurried through in a perfunctory manner. The objective is to make the student familiar with the procedure that must be followed in the solution of typical problems in physiology, so that he may be able to understand *how* the truths of the science have been discovered. To attempt, as some instructors have done, to provide experiments illustrating all the facts of physiology which the physician must know, is of little value compared with having the student carry through a few typical experiments thoroughly. He can then soon learn the facts.

It really does not matter very much what experiments are chosen, so long as they illustrate the principles upon which discovery depends. The earlier ones should be as simple as possible, and for this purpose nothing could be better adapted than the nerve muscle preparation and the heart of the frog. The advisability of requiring medical students to perform experiments on frogs' muscles is sometimes questioned on the ground that the results can be of no so-called practical value. For a physician this is the wrong view to take. It is not because of the results themselves that the experiments are performed, but because the experiments introduce the student to the quantitative study of animal function, and teach him something of the behaviour of living as compared with dead matter. In physical science the experimental conditions are under control, and the results can be stated in terms of mathematics; they are more or less predictable, but in physiological science, living structures being concerned, many of the factors are beyond control, and it requires experience to interpret the experimental results correctly. Experiments must often be repeated many times with modifications before any conclusion can be drawn from the results. The experience gained in the physiological laboratory prepares the student's mind to analyse the causes responsible for the symptoms of disease, besides, of course, training his hands to carry out measurements of precision, which may give him useful information for diagnosis and for treatment.

After he has made a beginning with these simple experiments the student is in a position to be taught the principles and facts of physiology. He can now follow intelligently the steps in the experimental proofs by which these have been brought to light, and can attend a course of lectures and use his textbooks with profit. It seems to me that it would be just as hopeless for an engineer to try to become efficient in understanding the working of a piece of machinery solely by reading books and listening to lectures as for a medical student to understand the workings of the body by similar methods.

Fundamental principles having been grasped and some practice had in drawing conclusions from experimental results, the student can appreciate the work of others and can form his own opinion as to the value of the evidence which is offered as proof. The theories and even the so-called laws of science are not final; they are merely the scaffolding from which a permanent structure of final knowledge is slowly built up, and it is only by actual experience in experimental work that the student can acquire this point of view. If he does not acquire it he will become bound by authority, a mere copyist of others, and can never develop that inquiring habit of mind which is essential to real success in the practice of medicine.

Side by side with the didactic instruction experiments on man himself should occupy the hours allotted to the laboratory. There are many of these which have a high value in training the mind, and besides are excellent in illustrating the fundamental laws of physiology. Practical studies of the heart beat, the pulse, blood pressure, and the air of the lungs, both in conditions of bodily rest and after muscular exercise, forced breathing, holding the breath, to mention only a few of the experiments which may be performed, introduce the student to the use of methods of measurement which he may use with profit in the examination of the patient, and his efforts in interpreting the results afford opportunity to test the laws which govern the circulation of the blood, breathing, and the control of the acid-base equilibrium of the body. Then some time must be spent in the study of the nerve reflexes and the special senses. Unless he is thus made familiar with the normal, how can the student expect to be able to detect abnormal function?

Training for Research.

So far I have confined my remarks to the training in physiology of those intending to be medical practitioners, and I have said nothing regarding the training of those who may wish to study the subject for its own sake, or to enter research either in this or some other domain of science. There are two groups of such students: (1) medical students, and (2) B.Sc. students. Let me first of all consider the needs of the former group.

In an average class there are usually two or three students who show special aptitude for scientific work and to whom opportunity should in some way be given so that they may get far enough to enter into unexplored fields of research in the fundamental sciences of medicine. The advantages of encouraging such students in this work are many, even for those who may ultimately go into practice, for not only will they acquire a practical working knowledge of methods of thought, as well as of manipulation, which will be of immense advantage in clinical work, but the critical judgment will be more developed, the knowledge of what science can do in the study of disease will be deepened, and the man thus trained will be in a much better position than the average medical student to carry out investigations in the clinic or in practice, which will add to our knowledge of the causes and treatment of disease.

This special training of research men cannot, of course, be undertaken as a part of the regular medical course, but in Aberdeen a beginning could be made by offering facilities during the summer months and by establishing one or two modest scholarships to enable a year to be spent in the laboratory. This could be done either after the second professional has been passed or after graduation. I can state as a result of experience that such a scheme is of undoubted advantage, not only to the student himself, but also to the university, in that it augments the output of research and engenders a spirit of inquiry in the minds of the other students, and thereby increases their interest in their studies.

With regard to research for science students provision has already been made by which those in science may take physiology either as a major or a minor subject. This is an excellent scheme and one which I will always take much interest in developing. Research in physiology as well as in medicine demands nowadays the team-work of many workers. The problems are so involved and the necessary measurements are so time-consuming that there are few which can be solved without collaborative effort.

Interdependence of Physiology and Medicine.

During recent years much has been heard of the desirability of a closer integration of the scientific and clinical subjects of the medical curriculum. The pioneer framers of this curriculum had clearly in mind the essential interdependence between physiology and its sister subjects and clinical instruction when they styled it the "Institutes of Medicine," but for various reasons a sharp line of demarcation has drawn itself between the two, and the clinical instructor finds it difficult to induce the student to utilise his knowledge of physiology to full advantage. This is a problem which is occupying the attention of medical instructors, for it requires no close analysis of the advances in medicine during recent years to see that a large proportion of them have been achieved very largely by the application of physiological and biochemical methods. The budding doctor should certainly not be allowed to enter on his life work in practice with the idea that the physiology and other scientific courses which occupied his earlier years at the medical school are of little practical value and were only tiresome stepping-stones to the clinical platform. He should, on the contrary, be made to realise that his success in keeping abreast with the times in his profession, whether as general practitioner or as specialist, depends on his remaining a student of the Institutes of Medicine, so that, as new principles of function come to be discovered, he may be in a position to seek their application in clinical practice. In my experience the most successful way by which this problem in medical education can be solved is by having a few lectures on applied physiology in the last year of the medical course, by holding joint discussions between the clinical and laboratory instructors of problems dealing with disease, and by having as instructors in the clinics at least a few who have spent a year or two in research work in the laboratories. I do not believe that every clinical specialist should necessarily have served an apprenticeship in purely scientific research, but I am convinced that the advantage of having some men so trained on the clinical staffs of our hospitals is of incalculable benefit both for the welfare of the patients and for the instruction of the medical student.

Finally, let me say that although physiology and biochemistry and their related subjects are properly styled the "Institutes of Medicine," and must ever form the basis of a sound training for the practising physician and surgeon, they are also sciences by themselves, self-contained fields of knowledge of wide human interest, and with many other applications than in that of the study of disease. They should therefore occupy an important place in the organisation of every university.

BIOCHEMICAL DIAGNOSIS OF PREGNANCY.

THE NEW HORMONE TEST.

IT would be very useful to have a simple test for pregnancy, which would definitely indicate its presence or absence, and the hope of finding one has inspired much work of late years, especially in Germany and America. As a result, many tests have been devised which seemed to solve the problem completely when they were first described, but their practical value has not been confirmed.

These reactions have, in the main, been based on two ideas; either upon the specific ferment theory of Abderhalden, which postulates the appearance of a specific protein in the blood during pregnancy, or upon a study of the production of glycosuria in the person undergoing the test. Perhaps the best known of them is the Abderhalden reaction,[1] but investigators in various parts of the world have reported that they have been unable to get satisfactory results by any of the numerous modifications in which the technique has been presented from time to time, and Smith and Shipley[2] state definitely that the test is of no value for the diagnosis of pregnancy. The epinephrin-glycosuria test,[3] Kamnitzer's phlorizin test,[4] the dextrose test and the red cell precipitation test of Fahraeus [5] have all been declared to be of little or no practical value as tests for pregnancy. Interest is at once aroused, therefore, when a test appears which is based upon a new or little investigated principle.

Our knowledge of the hormone which is variously described as the ovarian hormone, the œstrus-producing hormone, œstrin, or the female sexual hormone, has increased very greatly during the last few years, thanks to the work of Allen and Doisy and others. The presence of this hormone has been held to be associated with the growth of the uterus and increased development of the breasts occurring in pregnancy; and a report of enlargement of a mouse's uterus resulting from the injection of blood from a pregnant woman was published in 1924 by Binz.[6] Frank[7] detected the presence of the hormone in the blood of non-pregnant females, fluctuating in correspondence with the normal menstrual cycle. The same author (loc. cit.) and also Fels,[8] Aschheim,[9] Trivino,[10] and Siddall,[11 12] have found that the amount of the ovarian hormone in the blood during pregnancy shows a great increase, which disappears shortly after the uterus is emptied.

Since, according to these observers, the hormone makes its appearance soon after conception, it is

evident that the demonstration of its presence in the blood might be made the basis of a test for pregnancy. There have been two main obstacles to the application of this method: first, the practical difficulty of evolving a technique for demonstrating the presence of the hormone and its approximate amount; and, secondly, the establishment of the validity of the method, which would clearly require a very large number of control experiments upon pregnant and non-pregnant, normal and pathological subjects. The qualitative demonstration of the presence of the hormone had been studied for many years, since the experiments of Fellner[14] in 1913 showed that extracts of placenta and of the female sexual organs were able to bring about uterine growth in immature ovariectomised animals, and similar results were obtained in normal immature animals by Hermann[15] two years later. These observations have since been repeated many times and, whilst it cannot be said that this type of method is entirely satisfactory, it is nevertheless a useful indication of the presence of the hormone. The specificity of methods depending upon increase of growth of the uterus is, however, disputed by Zondek,[16] who states that increase of growth alone is a very uncertain criterion of the presence of the hormone. Nevertheless, they have been commonly used by scientific workers for some time and, together with the later methods based upon a study of the vaginal smears of immature or ovariectomised animals, have been of very great service.

In two recent papers by Siddall,[11 12] the application of this work to the diagnosis of pregnancy is investigated. The patient's blood is taken, is allowed to clot, and the serum, which is kept in a sterile tube in a refrigerator, is injected daily in doses of 1 c.cm. into an immature virgin white mouse. On the sixth day the animal is killed and is weighed; the uterus and the ovaries are dissected out in one piece free from their attachments, and are accurately weighed; the ratio of the mouse weight to the combined weight of the uterus and ovaries is calculated and this ratio is used for the diagnosis. If this ratio is less than 400 to 1 the test is considered positive; if more than this, the test is negative. The size of the ovaries is also considered as supplementary evidence if the mouse is not too young. The author gives a summary of the results in 142 cases examined, of which nine only were erroneous. In 19 tests on women less than three months pregnant one erroneous result was obtained. The table, however, includes a number of males (one positive result), and it may be relevant that many of the patients examined belonged to black races.

These results show that the test has considerable potentialities, which can only be truly assessed by a continued and fuller investigation. At this stage we may return to the work of Zondek and Aschheim. In a recent paper[13] these authors consider in detail a method that they first described earlier in the year.[17] Zondek's view is that the ovarian hormone is a secondary one, produced by stimulation of the ovary by the hormone of the anterior lobe of the pituitary, and that this is the mechanism whereby the ovarian hormone is set free. They have shown, for example, that transplants of the anterior pituitary lobe produce very marked effect on the ovary, particularly in the number and size of follicles and corpora lutea, and they claim to have produced an aqueous extract from the anterior lobe that will bring about a similar result. Such extracts have no effect upon ovariectomised animals. This observation seems to shed a great deal of light on the problem. It has been shown by Loewe[18] that the urine of women also contains small quantities of a hormone which, when injected into mice, will bring about changes in the ovaries and uterus which have generally been associated with the ovarian hormone. According to Zondek and Aschheim the ovarian hormone is accompanied by the anterior pituitary hormone; but whilst the ovarian hormone is excreted in the urine of both pregnant and non-pregnant females, and, according to Laqueur,[19] even of males, the commencement of pregnancy is quickly followed by an "explosive production of anterior pituitary hormone, the inundation of the blood with the hormone and its excretion in the urine" (Zondek, 1928). The detection of the hormone is based upon the anatomical examination of the test animals, and the demonstration of the presence of hæmorrhagic centres and of corpora lutea in the ovaries, following the injection of the patient's urine. Five mice of from three to four weeks old, whose weight is between 6 and 8 g., must be used for each test; 6 doses totalling 1·2 to 2·4 c.cm. are given to each mouse, the period of injection extending over 48 hours, and on the fifth day the mice are killed and their ovaries are examined. Under these conditions Zondek claims that the test is specific for the anterior pituitary hormone, and that direct injection of urine, other than that from a pregnant female, will not cause these changes, since in these cases the anterior pituitary hormone is present in traces only. In this respect Zondek claims that the test is superior to that depending on the presence of the ovarian hormone because, besides pregnancy, functional ovarian disturbances such as the climacteric and "hyperhormonal amenorrhœa" can cause the excretion of large amounts of that hormone in the urine. On the other hand, the demonstration of the anterior pituitary hormone in small quantities (1·2 to 2·4 c.cm.) of the urine, by Zondek's method and technique, is claimed to be a specific biological test for the early diagnosis of pregnancy, actual or only recently terminated.

Aschheim[20] gives the results obtained from a large number of cases. Of 258 control urines examined, 1·6 per cent were positive, whereas of 197 specimens of urines from normal pregnancy only 4 gave a negative response. If these results are confirmed by other workers it is clear that they will prove to be of very great value to all those who are concerned with the diagnosis of pregnancy.

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THE LONDON MEDICAL EXHIBITION.

(*Concluded from p. 777.*)

Milk and Food Products.

THE WEST SURREY CENTRAL DAIRY CO., LTD. (Cow and Gate House, Guildford, Surrey), demonstrated various preparations of dried milk, their now well-known "Cow and Gate" Brand being produced under conditions which ensure the full dietetic value with strict attention to hygiene. Half Cream, Full Cream, and Lacidac which contains lactic acid were shown as well as Brestol, a humanised cream.—GLAXO (56, Osnaburgh-street, London, N.W.) displayed their Ostelin, which is a physiologically standardised concentrate of vitamin D; Ostelin

in glycerine, four drops being the equivalent in vitamin D value to 1 drachm of cod-liver oil; Ostomalt, Ostelin tablets, and Ostelin emulsion. Ostelin ampoules, elixir Ostelin, and Ostelin with parathyroid tablets were also shown.—HORLICK'S MALTED MILK CO., LTD. (Slough, Bucks). The malted milk of this firm has a high vitamin content, and in addition to ordinary diet forms an efficient invalid food. Malted Milk Toffee was also shown.—TRUFOOD, LTD. (Creameries, Wrenbury, Cheshire, and Lever House, Blackfriars, London), showed Humanised Trufood for infants, which is claimed to be practically identical with breast milk, their Full Cream milk product for infant feeding from 9 months onward, and for nursing mothers and invalids, and Secway, whey in powder form.—NESTLÉ AND ANGLO-SWISS CONDENSED MILK CO. (6 and 8, Eastcheap, London) called attention to the scientific care and control under which their milks are produced. These included full cream sweetened condensed milk, milk food prepared in powder form, "Ideal" milk, unsweetened, and Thick Cream, free from preservatives.—HOVIS, LTD. (London, Manchester, Macclesfield, and Bristol), demonstrated the process of converting wheat into flour and the advantages of their process of making Hovis bread which has a large vitamin B content.—ENERGEN FOODS CO., LTD. (Energen Works, Willesden, N.W.), drew attention to their standardised bread, biscuits, and cereals. The bread, which is in the form of batons, rolls, loavettes, and rusks, has constant carbohydrate and protein proportions, thus enabling the doctor to prescribe and adjust a dietary with precision.—BRAND AND CO., LTD. (Mayfair Works, Vauxhall, London), showed a number of invalid food specialties, including their essence of beef and chicken; Brand's Meat Juice, in which the albumin is retained in an uncoagulated form; Ferrocarnis, an iron tonic food; liquid peptone, a new pre-digested liquid food prepared from beef and barley malt; and calf's foot jellies of varying flavours.—BOVRIL, LTD. (148–166, Old-street, London, E.C.), showed their now well-known Bovril and Invalid Bovril, the latter of which is a special form without seasoning, is more highly concentrated, and has a greater albuminoid content.—OXO, LTD. (Thames House, Queen-street Place, London, E.C.), showed their various preparations, including Oxo in fluid and a solidified form as cubes, and Hospital Oxo, which is specially prepared for invalids and is peptonised and unseasoned. The stall also prominently exhibited "Oxoid" endocrine preparations in variety, and "Liveroid," liver juice for the treatment of pernicious and general anæmia. Lemco and Tab Lemco, as well as a preparation of the natural juice of fresh lean beef, containing soluble uncoagulated proteids, were also shown.—CADBURY BROS., LTD. (Bournville), exhibited their various preparations of cocoa and chocolate. Every half-pound of Dairy Milk chocolate contains the equivalent of one and a half glasses of full cream English milk.

MISCELLANEOUS.

THE DENVER CHEMICAL MANUFACTURING CO. (London, E.) displayed the well-known Antiphlogistine, an hydroscopic, antiseptic poultice for use in superficial and deep-seated inflammatory and congestive conditions.—PASTILLES, LTD. (124, High-street, Shoreditch, London, E.), exhibited the Lakerol Brand Bronchial Pastilles, which are useful for those who have to use their voices extensively.—J. C. ENO, LTD. (Pomeroy-street, London, E.C.), demonstrated the pleasant, effervescent saline laxative, Eno's "Fruit Salt."—KEEN, ROBINSON AND CO., LTD. (Carrow Works, Norwich), made a feature of Almata, a complete food for infants; Robinson's Patent Barley, Groats, and Waverley Oats, and Keen's Mustard Ointment.—THE THERMOGENE CO., LTD. (Hayward's Heath, Sussex), exhibited Thermogene, a medicated wadding which acts as a skin stimulant.—THE JAEGER CO., LTD. (95, Milton-street, London, E.C.), displayed their pure wool clothing

THE MEDICAL SICKNESS, ANNUITY AND LIFE ASSURANCE SOCIETY, LTD. (300, High Holborn, London, W.C.), which was founded in 1884 to enable doctors and dentists to obtain sickness, accident and life assurance policies on the best terms, is managed by members of the medical profession, and the stand exhibited the many advantages which accrue from the policies issued by the Society.—THE MEDICAL AGENCY (W. H. Grant) (Watergate House, York-buildings, Adelphi, London, W.C.) demonstrated the service which it renders in the buying and selling of practices and in the supplying of locum tenens.

SPAS AND WATERS.

By pictures, literature, and objects illustrating treatment, several spas demonstrated the advantages of balneological treatment. BATH, with its natural hot springs and wide variety of treatments, specially called attention to "The Book of Bath," a new official handbook elaborately illustrated, containing among its interesting features an account of the city's archæological treasures and a reprint of the Proceedings of the important Conference on Rheumatic Diseases, which was held in May last.—BRACEBOROUGH SPA, Lincolnshire, which is known for its treatment of skin affections, is now recommended for latent infections owing to the high calcium content of its water (grs. 30·39 per gallon calcium bicarbonate) in the presence of free carbon dioxide.—BUXTON, with its radio-active thermal water and strong chalybeate spring, and its variety of treatments, called attention to its drinking cure, the water from St. Ann's Well being also obtainable as a table water.—DROITWICH. At the exhibit of this spa, the baths of which have recently been extended, attention was directed to the fact that the treatment is prescribed throughout the whole year owing to the suitability of the climate. Extensive developments are in progress.—HARROGATE, which has a diversity of waters, demonstrated the utility of a radio-active mud, Fango, which has recently been discovered and which promises to be of singular value among the many treatments already obtainable at this spa.—TORQUAY CORPORATION, South Devonshire, in addition to the various British and Continental methods of treatment at their spa, advertised the magnificent sun lounge with a Vita-glass structure, 95 by 18 ft.—INGRAM AND ROYLE, LTD. (Bangor Wharf, 45, Belvedere-road, London, S.E.), who are importers and exporters of natural mineral waters, salts and pastilles, exhibited a wide selection of their wares, including the well-known Vichy-Célestins.

PRINTERS AND PUBLISHERS.

ADLARD AND SON, LTD. ("Bartholomew Press," 21, Hart-street, Bloomsbury-square, London, W.C.), who specialise in medical and scientific printing, had an interesting exhibit, some fine three-colour work, and other forms of illustration being attractively displayed. A selection of the scientific and medical periodicals and Society Transactions and reports, illustrative of their printing work, was also shown.—BAILLIÈRE, TINDALL AND COX (7 and 8, Henrietta-street, London, W.C.) exhibited a wide range of medical books, calling special attention to Baillière's "Synthetic Anatomy."—WILLIAM HEINEMANN, LTD. (99, Great Russell-street, London, W.C.), showed a new and original text by Henry MacCormac, of Jacobi's "Atlas of Dermochromes," the first volume of a series of monographs of Medical and Surgical Science edited by Prof. R. J. S. McDowall, and many other medical books of interest.—H. K. LEWIS AND CO., LTD. (136 and 140, Gower-street, and 24 and 28, Gower-place, London, W.C.), who exhibited a selection of recent and standard works for the consultant practitioner and student, called attention to their scientific and circulating library.

It should be noted that the London Medical Exhibition has now so outgrown the floor-space available at the Central Hall, that it has been decided to hold the Exhibition in 1929 at the Hall of the Royal Horticultural Society at Westminster.

GENERAL MEDICAL COUNCIL.

ELECTION OF TWO DIRECT REPRESENTATIVES FOR ENGLAND AND WALES.

Two names were selected last July by English and Welsh deputies at the annual meeting of the British Medical Association, for nomination on behalf of the Association as Direct Representatives of the registered medical practitioners of England and Wales on the General Medical Council. These were Dr. J. W. Bone (Luton) and Dr. E. K. Le Fleming (Wimborne). On their behalf the following election address has been circulated :—

At the present time two only of the members of the General Medical Council are general medical practitioners. We believe that there is a widespread feeling in the profession that such representation is inadequate, and that opportunity should be taken at this by-election to place upon the Council two Direct Representatives who have the closest possible touch with the problems and difficulties of general practice. The sphere of consultant practice is well cared for by the representatives of the various universities and licensing bodies, who, also, have done yeoman service in developing and improving medical education.

It may be, however, that the educational outlook has in the past been rather from the angle of the teacher, and that a further leaven of members engaged in family practice would assist the Council in guiding those who have the duty of preparing the medical student for a career which in the great bulk of cases is that of a general practitioner. The penal procedure, which occupies so much of the Council's time, deals often with situations arising in the lives of general practitioners. Further, the Council is frequently consulted by the various Government Departments in relation to Parliamentary Bills and to proposed new regulations. In many instances, and particularly where the National Health Insurance Service is concerned, these are matters of great moment to the general practitioner but of little interest to the teacher or consultant.

We are both in the active pursuit of our profession, and have had much experience of administrative and medico-political work. One of us (J. W. Bone) has had 32 years in general practice, private and contract, in the industrial area of Luton; has served on the Insurance Acts Committee for five years, and now has the honour to be a member of the Council of the British Medical Association and chairman of its Medico-Political Committee. The other (E. K. Le Fleming) is familiar with other aspects of private and contract practice through 27 years' work in the rural area of Wimborne, whilst in addition to serving on the Council of the British Medical Association and on the Insurance Acts Committee, he has been honoured by the confidence of insurance practitioners for the past five years as chairman of the Conference of Local Medical and Panel Committees. Our candidature has been endorsed by the English and Welsh members of the Representative Body of the British Medical Association.

Our experience in interpreting the collective views of our fellow practitioners and our willingness to devote whatever time and energy may be necessary to the proper fulfilment of the duties of a Direct Representative embolden us to solicit, not only your own vote but your active assistance in securing the votes of your colleagues.

J. W. BONE, M.B., C.M. Edin., B.Sc.
E. K. LE FLEMING, M.B., B.C. Cantab. M.R.C.S., L.R.C.P., B.A. Cantab.

The Medical Practitioners' Union has issued an address on behalf of two Reform Candidates who are standing under its ægis—namely, Dr. E. A. Gregg (London) and Dr. Gordon R. Ward (Sevenoaks).

It is now 70 years since the General Medical Council came into existence. It is neither surprising nor discreditable that it should be found somewhat ill-adapted to modern conditions. The following defects are particularly evident: (*a*) The almost negligible representation of the public, for whose protection the Council exists; (*b*) the scarcely greater representation of general practitioners, with whose education and affairs most of the Council's work is concerned; and (*c*) the difficult position of the Council in disciplinary matters.

We feel that reform can best come from within and that the Council itself should prepare a schedule of reforms for the approval of the State. We believe that there will be no lack of goodwill amongst its members to this end. At the same time we cannot overlook the fact that the election of candidates definitely pledged to initiate the necessary discussions has become essential. Neither by word nor deed have our sitting members sought for reform, nor are any other candidates pledged to it.

In these circumstances, we ask that you will record your votes in our favour and afford us that opportunity of which your previous representatives have failed to take advantage. We may perhaps add that we have each given many years of service in medical organisation and public work.

EDWARD A. GREGG, L.R.C.P.I., L.R.C.S.I.
GORDON WARD, M.D.

Dr. Gregg is an Ulsterman by birth, 47 years of age, who qualified in Dublin in 1909, and whose public record is set out thus :—

He is well known in medico-political circles for his keen advocacy of the family practitioner's cause. He has given for many years both time and energy to the work of medical organisation in spite of the heavy claims of a busy and arduous practice. There is no important centre in the country Dr. Gregg has not visited frequently, travelling by night in order to eke out the time available to the utmost. He has always set forth a high standard of efficiency and service for his profession. He has consistently urged the importance of associating the practitioner with the local hospitals, public health clinics, and health services generally; claiming that the maximum result can be produced through utilising the services of the family doctor.

Dr. Gregg is an experienced public man, being an alderman and past mayor of the Metropolitan Borough of St. Pancras, and a past chairman of the St. Pancras Board of Guardians, besides holding chairmanships of public health, hospital, and other committees. He has so far refused invitations to allow his name to go forward as candidate for Parliamentary honours, although several such invitations have been tendered to him. He has served for many years on the Insurance Acts Committee. He has also been for many years a prominent member of the London Insurance Committee, and is vice-chairman of the London Panel Committee. He was one of the moving spirits in setting up a public medical service for London.

Dr. Gregg has been closely associated with the Medical Practitioners' Union since its inception, and for the past four years has been elected each year as President.

On his own behalf Dr. Ward adds—

The General Medical Council is intimately concerned with the life of the general practitioner. His education proceeds under its auspices and his daily work is governed by its rules. Nevertheless, it contains only two general practitioners to-day and has vacancies for only two more. Its constitution allows of only one-tenth of its members being elected by the profession at large. This may well have been a suitable arrangement 70 years ago but it has led of recent years to difficulties which have injured the prestige of the profession and which ought not to be allowed to recur.

The remedy is an alteration of its constitution in such manner as may seem best after proper consideration of all sides of the question. The gentlemen whose names have been put forward by the British Medical Association are anxious that they themselves shall be elected because they are general practitioners, but they do not advocate increasing the one-tenth mentioned. The sitting members, also B.M.A. representatives, have actually disavowed this policy. It is evident that these gentlemen are contented that the specialist and educational element should continue to far outnumber that of the general practitioner. They see no sign of the times in the fact that the dental and nursing professions have secured much more favourable treatment. They are, one assumes, equally content with the almost complete exclusion of representatives of the public. With this attitude I have but little sympathy. Of my own qualifications to speak for my colleagues in the profession I speak with some diffidence. I was, very long ago, one of that London Medical Committee which strove to prevent the Insurance Act coming into operation. Since National Health Insurance became inevitable I have (with the exception of nearly five years' war service) been closely associated with its various administrative aspects, as also with other medical work, local government, &c. I am a general practitioner and it is as such, and in the interests of general practitioners, that I ask the favour of your votes.

MANCHESTER TUBERCULOSIS DISPENSARY. — A Ministry of Health inquiry was held in Manchester on Oct. 11th into the proposal to transfer the corporation's tuberculosis dispensary, now situate in Hardman-street in the centre of the city, to a site in Oxford-road opposite the Royal Infirmary. The inquiry was conducted by Dr. J. E. Chapman and Mr. H. Pearson, the medical officer and architect appointed by the Ministry. During a hearing lasting from 11 A.M. until 7 P.M. evidence was given for the corporation by the medical officer of health, Dr. R. Veitch Clark, and other officials; Mr. H. D. Hudson represented a large number of ratepayers with houses and premises near the proposed site who objected to the erection of the dispensary there. The inspector intimated that after he had visited the existing premises and the proposed site a full report would be forwarded to the Ministry of Health.

MEDICINE AND THE LAW.

Liability of Motorist for Hospital Treatment.

SURGEONS on the staff of a local hospital have good reason to be aware of the fact that, as the result of traffic accidents, many patients are admitted to the hospital who have no connexion with the locality. At the Ashford County Court last month there was a decision of considerable importance as to the liability of such patients to pay fees. The decision does not present any novel extension of the ordinary law of implied contract, but it is interesting as showing the strong view taken by a particular judge in a particular set of circumstances. The action was a claim by Drs. A. and V. Don, of Ashford, for 35 guineas, against Mr. Usick, a resident at Muswell Hill, in respect of a surgical operation and attendance upon a young man of 18 who had been admitted to Ashford Hospital as the result of a motor accident. The case for the plaintiffs was that the patient had been admitted as a private patient, the hospital rules being that patients non-resident in the district should be deemed private patients, and that private patients should be liable for medical fees in addition to hospital charges although necessitous cases might be dealt with free. A charge of 13 guineas for treatment had been paid to the hospital; the receipt given by the hospital for this sum had made it clear that this charge was for treatment only and not for a surgical operation. The case for the defence was that the payment of 13 guineas was sufficient, that there was no implied contract to pay for the surgical operation, that the hospital rules had not been brought to the notice of the patient, and that the defendant had never been asked if he wanted a private ward. Dr. Alexander Don, giving evidence, said the defendant was unconscious when brought to the hospital and that it was difficult to determine the extent of the injuries at the time. He examined him on admission and operated upon him the next day when the defendant was able to communicate with his friends. Nearly the whole of the left ear was torn away and great pains were taken to get the ear to stay on the head instead of the more obvious course of taking the ear away. He continued to treat the defendant for 14 days, after which period the patient was taken home, the operation having been thoroughly successful. These facts were presumably admitted; the dispute in the case seems to have involved two questions—first, was the patient a private patient who impliedly undertook to pay a reasonable reward for the professional services he received; and, secondly, what was a reasonable charge for those services? About the first question His Honour Judge Terrell never seems to have had any doubt. If a man meets with an accident and is unconscious and a doctor attends to him for some time, is not that doctor, asked the judge, entitled to be paid? Does it make any difference, he pursued, if the man goes to a hospital. Yes, replied counsel for the defendant, because a hospital is erected by public subscription and is used for the benefit of persons who meet with injuries. There was no obligation upon the hospital, rejoined the judge, to attend to your client. On the second question it was protested on the defendant's behalf that he was not a wealthy man. It appeared, however, that he possessed two motor-cars, and that a portable wireless set had been brought to the hospital by the young man's parents, these circumstances suggesting that the family's standard of living was at any rate fair. In addition there was the fact that the defendant on his notepaper advertised himself as the "largest retailer in Great Britain for lighting, heating, and radio." The judge held that it could not be concluded that the patient was a poor boy. He gave judgment for the sum claimed, and added that the patient was very lucky to have had such a skilled surgeon to put his ear on for him.

Being the decision of a county court, the case cannot be cited as a precedent; if, however, similar facts exist, a similar decision may confidently be expected.

Frauds on Doctors and Infirmaries.

Sentence of six months' imprisonment was passed on Sept. 27th at Pontefract Petty Sessions upon Eric Ronald Cox, who was charged with obtaining money from Dr. G. Burnett and food from the local infirmary by false pretences. It was stated that the accused called on Dr. Burnett and presented a card bearing the name "Dr. Wm. Gray, M.B., Ch.B."; he said the Medical Council had paid his expenses from Switzerland as far as London, and that he wanted assistance to get to Edinburgh. The same evening he sent in his card to Dr. Barrett at the infirmary, declared that he was suffering from emphysema, and was thereupon placed in a private ward. His description of his symptoms was inconsistent, and Dr. Barrett, on becoming aware of the visit to Dr. Burnett on the previous day, asked Gray where he had spent the previous night. Gray replied that he had spent it in the Manchester Infirmary and had come to Pontefract that day. Dr. Burnett was able to identify him and the case was placed in the hands of the police. Before the bench Gray put in a long written statement, in which he stated that he had given up a good position to join the army, had been invalided out of the service without pension, suffering from tuberculosis, and had been "treated worse than a leper." He asked to be dealt with under the Probation of Offenders Act and to be given a chance which he had not yet had. His police record, however, showed a series of convictions for similar offences. An inspector said that Gray seemed to spend his time obtaining money from doctors on the representation that he was a physician whose name was actually to be found in the Medical Directory, and obtaining food and lodging at public infirmaries. After a previous sentence of six months he had abused the hospitality of the Rotherham Infirmary by taking some of its notepaper and thereon writing himself a testimonial (purporting to be signed by the medical officer) certifying that he had acted as locum-tenent there for three weeks and had given every satisfaction. He had obtained money from medical practitioners at Rotherham, Leeds, and elsewhere, and had received lodging at the Leeds Infirmary and at the Beckett Hospital, Barnsley. The accused, who appeared to be a well-educated man, described himself as articled clerk to a firm of chartered accountants at Birmingham.

IRELAND.

(FROM OUR OWN CORRESPONDENT.)

The Dublin Hospitals.

DISCUSSIONS of the problems of the Dublin Hospitals has been carried further by an article in the *Irish Statesman* of Oct. 13th. The writer believes that if amalgamation could take place economies could be effected and better service given, but he says that there is no general agreement among doctors as to what is best to be done.

"A system grew up which the younger men, and some of the older, now feel has many defects, but it has many noble traditions of public service, and it is natural that those associated with the system, conscious of the fine work done, should not desire any change, but only a better system of financing the existing institutions."

He goes on to point out that there is at present wasteful expenditure due to overlapping, and that none of the several hospitals are really complete or up to the finest modern requirements. He suggests that as voluntary efforts have failed, a Commission should be set up to inquire into the hospital system of Dublin. This Commission should include doctors from other countries such as America, England, and Germany, and before making a report or recommendations its members should have investigated hospital systems in other countries. The writer further holds out the hope that if a scheme could be agreed on, assistance might be given by the

Rockefeller Foundation for carrying it into effect. It is true that the Foundation is not interested in hospital work as a charity, but it is deeply interested both in the medical education and the research which are carried on in hospitals.

In comment on these views, it may be said that the failure so far of the scheme of amalgamation of certain hospitals is not due to differences of opinion among either the medical staffs or the boards of governors of these institutions. The staffs and the governors of five of the smaller hospitals agreed some years ago to a scheme of amalgamation if money could be found for the necessary capital outlay on a building. The scheme is still at a standstill because money has not been found. Again, on a minor point, the writer is probably unduly optimistic in looking for much saving of expenditure by the amalgamation of hospitals. There will be some, no doubt, but it will be far out-balanced by the additional expenditure which will be necessary to run an institution according to modern requirements.

An Address on Jurisprudence.

At the opening of the winter session of the Royal Victoria Hospital His Honour Judge Thompson, Recorder of Belfast, delivered an address in the King Edward Memorial Hall, at which Prof. Andrew Fullerton presided. A lawyer, said the Recorder, had been asked to give the address presumably because his orbit, like that of the doctor, touched nearly every aspect of human life; often indeed their orbits intersected, when the lawyer's knowledge and interest came into contact with the doctor's and the science of medical jurisprudence sprang into action. He asked his hearers to bear in mind that the function of the medical jurisprudent or witness was to assist the court and not merely to assist his client or patient. The qualifications of the good medical witness were medical and general, and from the point of view of the court the general qualification might be the more important. Doctors should know how people lived, how they carried on their trade, and, generally speaking, the conditions under which they lived. Suppose medical evidence was required in a case in which a man was injured by machinery. They had to make up their mind if the accident could have been caused in the way the patient told them. They must test the patient's story. A patient might describe herself as a reeler, or a doffer, or a winder. Did those words convey anything to the medical man concerned in the case? Unless they knew something about the trades they could not give advice or evidence that was worth having. How the injury was caused was of vital importance, and they must be curious about their patients and find out all about them. The extern department, said the Recorder, was an excellent school for that purpose, for there they met every day patients who had sustained injuries in every kind of work. He advised the doctor to visit the scene of accidents, to inspect the machinery himself, and thus be able to tender first-class evidence. The chief failing of the young doctor in court was in being too technical. Above all things he should be thorough. Finally, the Recorder advised punctual attendance at the court; cases had often been lost because the medical witnesses were late.

Extension of the Samaritan Hospital.

During her visit to Ulster last week Princess Mary opened the new extensions of the Belfast Samaritan Hospital, where she was received by Major-General F. F. Ready, officer commanding the Northern Ireland district, and Viscount Craigavon, Prime Minister of Northern Ireland, who is chairman of the executive committee of the hospital. A number of presentations were made to Her Royal Highness, including Miss Florence E. Henderson, president of the hospital, and Sir John Campbell, M.P., senior surgeon, Dr. W. R. MacKenzie, and Mr. T. S. Holmes, hon. surgeons. Miss Henderson, who presided at the ceremony, described the hospital as the only one in Ireland exclusively devoted to the treatment of women. Surgical work had been carried out under increasing difficulties owing to the lack of theatre accommodation; the names of StClair Boyd, one of the first surgeons to the institution, and of the late G. Adams Hicks were perpetuated in two of the private wards, while that of the present senior surgeon, Sir John Campbell, to whom they were indebted for the equipment of the first operating theatre, would be attached to the new operating unit. The hospital was one of the first to be handed over for the care of the wounded during the late war. Sir John Campbell briefly sketched the history of the hospital which was established in a house in Carlisle-street by the late Dr. W. K. M'Mordie in 1872, the present building being erected two years later, and the architect, Mr. Thomas Houston, presented Her Royal Highness with a golden key.

Royal Academy of Medicine in Ireland.

The report of the year 1927–28 was presented at the annual general meeting of the Royal Academy of Medicine on Oct. 11th. The membership and the attendance at meetings had increased from the previous year. The following were elected or re-elected to their several offices: President, Sir William Taylor; General Secretary and Treasurer, Dr. T. P. C. Kirkpatrick; and Secretary for Foreign Correspondence, Mr. L. A. Cassidy. Presidents of the Sections were elected as follows: Medicine, Prof. R. J. Rowlette; Surgery, Mr. R. A. Stoney; Obstetrics, Dr. G. FitzGibbon; Pathology, Mr. T. T. O'Farrell; State Medicine, Dr. J. W. Bigger; and Anatomy and Physiology, Dr. W. Fearon.

INFECTIOUS DISEASE IN ENGLAND AND WALES DURING THE WEEK ENDED OCT. 6TH, 1928.

Notifications.—The following cases of infectious disease were notified during the week:—Small-pox, 130 (last week, 94); scarlet fever, 2581 (last week, 2329); diphtheria, 1237; enteric fever, 90 (last week, 74); pneumonia, 930; puerperal fever, 47; puerperal pyrexia, 95; cerebro-spinal fever, 9; acute poliomyelitis, 13; acute polio-encephalitis, 2; encephalitis lethargica, 22; dysentery, 9; ophthalmia neonatorum, 98. No case of cholera, plague, or typhus fever was notified during the week. Scarlet fever is specially prevalent in Leeds and other parts of the West Riding of Yorkshire.

The number of cases in the Infectious Hospitals of the Metropolitan Asylums Board on Oct. 9th–10th was as follows: Small-pox under treatment, 12; scarlet fever, 2211; diphtheria, 1607; enteric fever, 55; measles, 68; whooping-cough, 263; puerperal fever, 19 (plus 15 babies); encephalitis lethargica, 70; poliomyelitis, 1; "other diseases," 14. At St. Margaret's Hospital there were 19 babies (plus 9 mothers) with ophthalmia neonatorum.

Deaths.—In the aggregate of great towns, including London, there was 1 death from small-pox, 4 (1) from enteric fever, 11 (2) from measles, 3 (0) from scarlet fever, 36 (14) from whooping-cough, 26 (6) from diphtheria, 146 (32) from diphtheria and enteritis under two years, and 57 (13) from influenza. The figures in parentheses are those for London itself.

The death provisionally classified to small-pox was assigned to the county borough of Gateshead. The fatal cases of enteric fever outside London were reported from Wigan, Halifax, and Hull. Four fatal cases of measles were reported from Liverpool. Manchester reported 4 and Liverpool 3 fatal cases of whooping-cough. The number of deaths from diarrhœa and enteritis is beginning to diminish; Liverpool reported 20, Birmingham 7, Leeds 6, Manchester and Sunderland 5 each.

The number of stillbirths registered during the week in the great towns was 278 (corresponding to a rate of 43 per 1000 births), including 39 in London.

VOLUNTARY AID DETACHMENTS.—A total of 90 men's and 801 women's detachments, comprising a total membership of 22,943, have received recognition by the War Office under the post-war scheme inaugurated in 1923. This is an increase of 40 detachments and 1044 members on the previous half-yearly returns.

Correspondence.

"Audi alteram partem."

THE MEDICAL REGISTER.

To the Editor of THE LANCET.

SIR,—Voting papers in connexion with the election of Direct Representatives to the General Medical Council will be issued to-morrow (Saturday, Oct. 20th) to all practitioners having registered addresses in England and Wales. Any such practitioner who does not receive a voting paper in course of post, whether he wishes to vote in the election or not, should immediately communicate with this office in order to ascertain that his address is correctly entered in the Register.—I am, Sir, yours faithfully,

NORMAN C. KING, Registrar.

General Council of Medical Education and Registration of the United Kingdom, 44, Hallam-street, Portland-place, London, W.1, Oct. 19th, 1928.

VACCINATION REFORM.

To the Editor of THE LANCET.

SIR,—In his humorous address published in your issue of Oct. 13th, Dr. J. Walter Carr made the apparently serious suggestion to abandon vaccination in Great Britain on the ground that this assured method of prophylaxis is no longer justified by the present mild type of small-pox. His contention is based on the highly problematical hypothesis that the mild type, only prevalent in this country during the last seven years, will remain so indefinitely. As Dr. Carr admits the protective value of vaccination, the only question at issue is the likelihood of the severe type reappearing again on any scale, for it has never been completely absent for even a few years, as in 1922 20 deaths in 64 cases occurred in East London, and a 44 per cent. mortality only last year in a small outbreak in North-west London.

Fortunately an authoritative pronouncement on this very point has been made recently by a committee of experts and research workers appointed by the Ministry of Health and the Medical Research Council under the chairmanship of Sir Humphry Rolleston, who concluded: "It is, therefore, uncertain whether the present conditions will become stabilised or whether small-pox will revert to the former type." They go on to point out that American experience proves that on several occasions after prolonged prevalence of the mild type it has suddenly reverted to the fatal form, and they quote the example of Detroit with a case-mortality of only 0·37 per cent. in 4681 cases from 1915 to 1923; yet in 1924 the mortality rose to 10·1 per cent. in 1610 cases, or a 27-fold increase, with 124 deaths from the most virulent hæmorrhagic form. Such a warning is surely a safer guide to practice than Dr. Carr's light-hearted suggestion.

Further, the same committee point out that in 1926 there were eight centres of virulent small-pox in Europe, and others throughout the Mediterranean area of North Africa, all in easy reach of our shores within the incubation period of the disease, to say nothing of India. In fact, the present prevalence of mild small-pox is but a measure of the danger when the severe form once more breaks out, and if Dr. Carr's proposal is taken seriously that danger will soon be increased many fold. It is true that revaccination of contacts has helped to control the disease, and the calamity of 1668 deaths in London alone in 1901–04 has since been averted, but to count on the indefinite continuance of such good fortune in face of increasing neglect of vaccination would be foolish in the extreme. The greatest obstacle to vaccination in this country is the ignorance of our people of what a severe epidemic of small-pox is like, due solely to the very success of the measure. Workers in India do know what it is like, and so did that home of the antivaccinist, Gloucester, in the 1895 epidemic.

I cannot understand how anyone with experience of severe small-pox, or even a knowledge of the 278 unvaccinated child victims who fill a corner of the Gloucester cemetery, can shoulder the grave responsibility of advocating the abandonment of vaccination in this country, with the moral certainty of the repetition sooner or later of the Gloucester tragedy. How many cases of virulent small-pox has Dr. Carr seen that he has so little respect for this terrible, disfiguring, blinding, and death-dealing disease, which is absolutely preventable, as in Germany before the great war, by the most effective prophylactic ever discovered?

I am, Sir, yours faithfully,

LEONARD ROGERS, Lt.-Col., I.M.S. (ret.).

South Hampstead, N.W., Oct. 13th, 1928.

MEASLES IMMUNE SERUM.

To the Editor of THE LANCET.

SIR,—In the papers on measles by Dr. W. Gunn (THE LANCET, Oct. 6th, p. 691), by Dr. D. McClean (THE LANCET, 1928, i., 548), and Dr. E. H. R. Harries (*Journal* of the Royal Sanitary Institute, 1928), reference is made to the lack of protection after the administration of the serum of horses which had been injected with the culture filtrate from Dr. Ruth Tunnicliff's coccus. When these horses were immunised, Dr. Tunnicliff's earlier work seemed to me to indicate that culture filtrate should be used for this purpose. The investigations reported seem clearly to establish that the serum of several horses, injected over long periods with filtrate, contained no demonstrable antibody.

It is only fair to say that I know that Dr. Tunnicliff herself is of opinion that immunisation should be done with whole culture, alive or dead, and not merely the filtrate, and she has kindly sent this suggestion to me. Up to the present it has been impracticable to try this method at these laboratories.

I am, Sir, yours faithfully,

R. A. O'BRIEN.

Wellcome Physiological Research Laboratories, Beckenham, Kent, Oct. 15th, 1928.

MASSAGE AND MEDICINE.

To the Editor of THE LANCET.

SIR,—I have only just seen Lieut.-Colonel J. K. McConnel's admirable article on the Slack Abdominal Wall in THE LANCET of August 18th. I need not trouble you with the reason why, but perhaps you will allow me to utilise the occasion to ask any of your readers who recall your recent kind advocacy [1] of the Chartered Society of Massage and Medical Gymnastics (on the occasion of the new issue of the members' register) to notice also the support that is given to your recommendation of the society by the evidence of knowledge and ability here displayed by one of the members.

You have suggested that, as a matter of fairness, the steady loyalty of the great majority of the society's members to the medical profession might well be reciprocated. I would submit that such reciprocity would be in the interest of the profession and to the advantage of a party not least concerned, the patient. It is generally held, as emphatically in the world of medicine and surgery as elsewhere, that any remedial treatment should be administered by members of an organised and regulated body rather than by individuals responsible only to themselves. It is equally, or nearly, as important that the certificate or diploma by which organised membership is distinguished shall be a genuine guarantee of trained efficiency. I beg for practical recognition of the fact, for which I can vouch from considerable and intimate experience, that the certificate of the Chartered Society is beyond comparison the most reliable guarantee of proficiency in the practice of massage, medical electricity, and medical gymnastic treatment. The society's certificate is recognised by

[1] THE LANCET, 1927, ii., 402.

the Admiralty, the War Office, the British Red Cross Society, and by all hospital and medical schools, and, with a very occasional exception, it is the only certificate recognised by them.

Unfortunately it is by no means the only certificate with which we meet. Of the rest, most are of little and many of no value, some being obtainable after a brief correspondence course. Moreover, the right and wise rules of the society, whereby the members are pledged not to advertise except in medical and nursing papers, and to work only in conjunction with a registered medical practitioner, play into the hands of the free-lance and the holder of some worthless diploma. The result is that, without the coöperation of the medical profession, those who have by training and examination (for the high standard of which I can again personally vouch) earned the right to style themselves chartered masseurs and masseuses, must continue to see much of the work available secured by practitioners, many alien, whose qualifications are inferior, but whose liberty of advertisement and independent practice is unrestricted.

It is hardly to be expected that loyalty of coöperation on one side only will long be maintained. If the medical profession generally will make it a rule to secure the services of chartered masseurs or masseuses when this form of treatment is desired, the continued loyalty of the society's members may be relied upon. If not, that loyalty cannot fail to be undermined, and the eventual result will be a loss to the profession and to the public.

I am, Sir, yours faithfully,

JAMES MENNELL.

Park-crescent, Portland-place, W., Oct. 16th, 1928.

WELFARE WORK AND THE PRACTITIONER.

To the Editor of THE LANCET.

SIR,—I venture to draw your attention to an existent state of affairs which is in my opinion derogatory to the medical profession and at the same time bad for the public generally. I suspect, too, that it may be as well known to many of your readers as to myself; and that proportionate to its prevalence may be the difficulty of dealing with it. I refer to the "management" of expectant mothers and healthy infants by what must now be a regular army of workers—mostly women—working in various fields, and directly or indirectly inspired by superior intelligence. Allow me first to make myself plain by illustration.

1. A woman to whom I had given the greatest possible interest antenatally gave birth to a child which died inexplicably a few hours after birth. Several days later (I was still in attendance) a health visitor called and had a long friendly talk with the mother; at parting her words were, "Well, be sure next time, as soon as you become pregnant come up to our clinic."

2. A well-to-do and cultured woman was delivered by me of a boy; several weeks after, on return from a nursing home, she was visited by a health visitor who was perhaps received a little coldly. Whether or no, the only warmth in the interview was on leave-taking when the visitor with the greatest possible kindness invited my patient to apply to the clinic if in any difficulty "as she knew all about babies."

3. A young woman of good social position found it necessary after a month to send her baby to a hostel for infants and at the same time, of course, to wean it. I wrote down and signed explicit instructions as to feeding the infant, adding that such rules were not to be deviated from unless a doctor so ordered. A few weeks there and it was brought home and placed under the care of a highly trained nurse, in whose care it remained for a week until I was summoned. I was astounded to learn (*a*) that in the hostel my directions had been ignored, and (*b*) that the nurse had ignored the hostel, believing the stools to show signs of indigestion for which she had proceeded to peptonise the milk for two hours (!) adding to it whey containing 2·1 (*sic*) per cent. of cream.

What, Sir, are we to deduce from these instances? I personally cannot but believe, apart from the demonstrable harm likely to result and the chaotic state of affairs shown thereby, that they indicate a singular lack of education in this host of auxiliaries, with whom, therefore, the blame does not lie, and in whom also the remedy is not to be found. Remedy I feel there ought to be, and that it is to be sought in such hospitals, institutions, and public services as are concerned, and whose teaching or otherwise responsible heads ought to be promptly, and if necessary coercively, approached by the medical profession as a whole. Else we shall have confusion worse confounded. I am, Sir, yours faithfully,

London, Oct. 13th, 1928. A. B.

SECURITY OF TENURE.

To the Editor of THE LANCET.

SIR,—The timely warning issued under the above title in last week's number of THE LANCET invites me to illustrate this warning by a concrete example. Three years ago I was appointed medical officer of a large poor-law infirmary. The advertisement gave no indication that the appointment was other than permanent; there was no clause as to any notice terminating the appointment. I took what I thought to be an adequate and necessary precaution by asking the committee that recommended my appointment to define my security of tenure. The infirmary was old, and vague rumours were abroad that it might be closed down in the near future. I was informed that in the *unlikely* event of the closure of the infirmary I should be offered another appointment or adequately compensated.

Unfortunately this was not secured in writing, but nevertheless was regarded as official from the committee making the appointment. No contract was signed except that of public vaccinator to the infirmary. The infirmary has now closed down. I was given three months' notice terminating my appointment and the guardians expressed a hope that I should be successful in the meantime in securing another appointment. No alternative appointment has been offered to me; no compensation has been paid.

The facts I have stated illustrate the false security of these appointments. Guarantees, though given by a responsible committee, are of no value unless they are *written* in the minutes or in a contract.

I am, Sir, yours faithfully,

Oct. 15th, 1928. DISILLUSIONED.

The Services.

ROYAL NAVAL MEDICAL SERVICE.

Surg. Comdr. J. D. Keir is placed on Retd. List with the rank of Surg. Capt.

Surg. Comdr. G. R. McCowen to *Victory*, for R.N. Barracks, Portsmouth.

Surg. Lt.-Comdrs. N. B. de M. Greenstreet to *Cambrian*; and A. B. Grant to *Concord*.

Surg. Lts. A. W. Forsyth to *Moth*; F. G. V. Scovell to *Colombo*; J. J. Cusack to *Vivid*, for R.N. Barracks, Devonport; S. J. Savage to *Dauntless*; and D. L. Pow to *Rosemary*.

ROYAL ARMY MEDICAL CORPS.

Capt. J. D. Corner, from the secd. list, is restored to the establishment.

TERRITORIAL ARMY.

Lts. A. A. Finnigan and A. M. Robertson to be Capts.

R. Pollok (late temp. Surg. Lt., R.N.) to be Lt.

C. de W. Kitcat to be Lt.

General Hospitals: Capt. W. J. S. Bythell, having attained the age limit, retires and retains his rank, with permission to wear the prescribed uniform.

INDIAN MEDICAL SERVICE.

Capts A. C. Craighead, Gurdas Ram Oberai, Jagdish Chandra, P. H. S. Smith, and H. J. H. Symons to be Majs.

Capt. (provl.) F. H. Whyte is confirmed in his rank.

To be Capt. (on prob.): F. R. W. K. Allen.

To be Lts. (on prob.): F. W. H. Caughey, and to remain seconded; J. S. McMillan, V. E. M. Lee, M. R. Sinclair, G. B. W. Fisher, R. A. Paton, A. V. O'Brien, G. F. Condon, S. T. Davies, E. S. S. Lucas, H. W. Farrell, D. Tennant, and H. S. Smithwick.

Temp. Capt. Mohan Lal Kalra relinquishes his temp. commn.

Aga Mohamed Hadi Shirazi to be Temp. Lt.

DEATHS IN THE SERVICES.

The death took place on Oct. 10th of Surgeon-General Alexander Ferrier Churchill, at his residence at Brentwood, aged 89. A graduate of Trinity College, Dublin, he entered the Army Medical Service in 1862, and served in the Sudan Expedition of 1884–85. He was in charge of the Wady Halfy Hospital, and for his services received the medal with clasp and the bronze star. In 1869 he married Ellen Louise Phayre, by whom he had one son and one daughter. Surgeon-General Churchill retired in 1899.

COLONIAL MEDICAL SERVICES.

Dr. P. H. Ward, M.O., Northern Rhodesia, promoted to P.M.O., and Dr. A. F. Wallace, M.O., Northern Rhodesia, to Sen. M.O. The following appointments have been made by the Secretary of State for the Colonies during the month of September: Mr. J. G. Green, M.O., West African Medical Staff, and Surg. Sub.-Lieut. R. D. Mackenzie, R.N.V.R., M.O., West African Medical Staff (Immunologist), Nigeria.

Obituary.

CHRISTOPHER HUGH LEETE RIXON, M.D. BRUX., M.R.C.S. ENG.

AT the early age of 41, Dr. C. H. L. Rixon died on Oct. 6th after a few days' illness. Since 1926 he had been medical officer at Parkhurst Prison in the Isle of Wight.

Son of the late Mr. Alfred Rixon, he was educated at Harrow from 1900 to 1904, and qualified from St. Thomas's Hospital in 1911. Among the resident appointments he held at the hospital was that of house physician to Sir Farquhar Buzzard, and this gave him an interest in neurology and mental disorder which he steadily maintained. During the war he served in the Royal Army Medical Corps with a captain's commission, being mentioned in despatches and twice wounded. He became officer-in-charge of the neurological section of the Reading War Hospital, and later senior medical officer to the Ministry of Pensions Neurological Hospital at Exeter. Dr. R. Eager, who worked with him at this time, writes of his exceptional enthusiasm for the work, of his fine understanding of psychological problems, and his cheerful helpfulness as a colleague. In 1921, after graduating as M.D. of the University of Brussels with highest distinction, he joined the prison service, and for five years was on the medical staff at Brixton Prison. He took the diploma in Psychological Medicine in 1922, and was the author, with Dr. D. Matthew, of a book on "Anxiety Hysteria," besides several useful papers, in our own columns and elsewhere, on the hysterical perpetuation of symptoms, the intelligence of criminals, and the diagnosis of mental conditions in adolescents. The problem of crime interested him especially, and it was his hope that in the Prison Service he would have an opportunity to throw light on the criminal mentality. Writing of his clinical work Dr. Norwood East says: "The keenness and ability which characterised him as a student distinguished him afterwards, and perhaps he was never so happy at his work as when examining a difficult case of cerebro-spinal disease or one of early mental disorder. His clinical acumen, and conscientious and unselfish devotion to duty made him a valued colleague; his manysided interests and keen sense of humour rendered him a delightful companion; and his sincerity, sympathetic nature, and upright character won him staunch friends."

Dr. Rixon leaves a widow, the elder daughter of Mr. W. L. Partridge, of the Indian Civil Service, with a son and a daughter.

BY the death of Dr. T. M. ALLISON on Oct. 8th Newcastle-on-Tyne has lost an able and much respected practitioner whose public services were considerable. Born at Guisborough in Yorkshire, he was the son of the late Mr. Thomas Allison. After a distinguished career as a student at the College of Medicine at Newcastle he graduated as M.B. in 1891 and as M.D. two years later. He acted for a time as assistant demonstrator of anatomy at the College and as visiting medical officer to the Newcastle Dispensary, and then joined the staff of the Royal Victoria Infirmary and the Newcastle Hospital for Women. Especially interested in tuberculosis and diseases of the chest, he was responsible for founding the Children's Sanatorium at Stannington, of which he became medical superintendent and later visiting physician. He was also at one time president of the Newcastle Clinical Society and the author of a book on "Health in Infancy" besides contributions to medical journals. For three years he held the presidency of the Newcastle Rotarian Club, and he was a keen member of the local Society of Antiquarians, a special interest being the collection of flails. During the war he served in France with the 59th General Hospital which he eventually commanded.

Dr. Allison married the daughter of Mr. E. S. Fletcher, and she survives him with a son and a daughter. Another son was killed about six years ago whilst serving in India.

THE death is announced of WILLIAM CASH REED, M.D. Edin., a pupil of Lord Lister. Seventy-eight years of age, Dr. Reed came of an old Quaker family and was born at Stoke Newington. He graduated in the University of Edinburgh in 1877 and after holding a house appointment at the North-Eastern Hospital for Children at Hackney, spent some time as ship's surgeon in the East. On returning to England he settled in Plymouth, where he was partly instrumental in founding the Homœopathic Hospital and where he remained some 20 years. The later part of his active professional life was spent at Liverpool, and at the Hahnemann Hospital there he held the post of junior gynæcologist, besides having appointments to several other institutions in the city, including the Seafaring Boys' Home, in which he was keenly interested. During the late war he served in a Paris Military Hospital, afterwards taking up his practice in Liverpool for a time. The last five years were spent at Exmouth, where he occupied himself largely with work for the welfare of prisoners in Exeter gaol and with the local branch of the St. John Ambulance Association. Dr. Reed married Miss Maud Higham, who survives him with a son and a daughter. His other daughter died not long ago.

THE CALCUTTA SCHOOL OF TROPICAL MEDICINE.—The annual report for 1927 of this school records under appropriate headings the manifold activities in teaching and investigation of the now great school established by Sir Leonard Rogers. Although under the Government of Bengal, the school in reality serves the whole of India, and students attend it from every province. The chief work of its staff is research in the special diseases of the country, and their published contributions give some indication of the zeal and ability with which it has been carried on. In judging their results, however, it is necessary to remember the influence they have in stimulating and maintaining all over India a new appreciation of the value of Western medicine.

DONATIONS AND BEQUESTS.—Mrs. Elizabeth Ann Magee, Chorlton-on-Medlock, Manchester, left £500 to Ancoats Hospital and Dispensary, and, subject to life annuities, £500 between the Cancer Pavilion and Home, Manchester, and the Royal Manchester Children's Hospital; £500 for the Royal Eye Hospital, Manchester, and £1000 for Ancoats Hospital and Dispensary.—The Hon. Anna Jane Peckover, of Bank House, Wisbech St. Peter, Cambs, left £1000 to the North Cambridgeshire Hospital, Wisbech.—Miss Elizabeth Haldane Wylie, of Victoria-road, Waterloo (Lancs), and late of Kincardine-on-Forth, N.B., who left £90,210, after some personal bequests and legacies left the residue of her property and the bulk of the estate for "such charitable institutions or objects in England or Scotland, and in such proportions as her trustees in their absolute discretion may select and determine."—Alderman George Herbert Strutt, of Bridge Hall, Belper, and Ardinglass, Argyll, left £1000 to the Royal Derby Infirmary, and £500 to Holbrook Convalescent Home.

Medical News.

UNIVERSITY OF CAMBRIDGE.—At a congregation held on Oct. 12th the following degrees were conferred:—

M.D.—H. Gardiner-Hill.

M.B. and B. Chir.—A. W. C. Mellor, T. M. Preece, G. M. Addison, G. H. Barendt, C. G. E. Plumstead, D. H. Belfrage, E. T. James, T. St M. Norris, P. G. Bentlif, L. A. P. Slinger, E. W. Lindeck, and H. Smith.

M.B.—G. G. Holmes.

B. Chir.—Hon. W. S. Maclay and M. R. Sinclair.

At a recent examination the following candidates were successful:—

SECOND EXAMINATION FOR M.B., B.CHIR.

Part III., Pharmacology and General Pathology.—W. I. Bain, W. C. Barber, J. H. Bartlett, W. D. Bell, J. G. Billington, R. W. Billington, S. E. Birdsall, H. W. Boake, O. H. Bostock, A. Bowen-Davies, W. V. Bowman, G. O. A. Briggs, A. H. Bulleid, H. G. H. Butcher, E. C. Campbell, C. M. Carr, A. B. Carter, J. G. Connell, G. T. Cook, F. J. Curtis, C. A. de Candole, W. D. Dick, J. R. Duffield, D. G. Evans, C. L. Ferguson, A. C. Fraser, W. G. Gill, W. E. F. Gough, D. G. Gower, E. R. Greathead, A. H. Gurney, C. S. Hall-Smith, G. W. Hall-Smith, J. B. Harman, D. Hay, B. Holden, J. Hughes, L. P. Jameson Evans, R. A. Jones, C. R. T. Lane, N. Langdon-Down, A. D. Latham, B. Lawn, J. C. Lee, D. L. Lewis, R. S. Lewis, T. E. S. Lloyd, B. F. Longbotham, J. L. Lovibond, F. D. MacCarthy, A. N. McCrea, A. B. MacEwan, D. B. McGavin, J. W. McLaren, S. M. Mankodi, C. E. P. Markby, G. C. Martin, M. H. Masina, J. M. Matthew, W. A. Mayne, T. D. F. Money, A. K. Monro, G. G. Mowat, W. H. Mylechreest, R. V. Payne, R. G. Pulvertaft, F. Radcliffe, J. P. Reidy, M. L. Rosenheim, W. W. Sargant, J. H. Shakespeare, F. W. Shepherd, S. M. Silverstone, P. M. Smyth, G. V. Steward, J. B. Tracey, O. S. Tubbs, T. M. Tyrrell, G. E. Walker, H. Walton, H. C. M. Walton, E. D. Ward, J. G. Warren, H. D. White, G. A. W. Whitfield, J. L. Wild, H. W. Williamson, W. C. Wilson, E. G. Byrde, M. M. M. M. Saleeby, and G. M. Spencer.

ROYAL COLLEGE OF PHYSICIANS OF EDINBURGH, ROYAL COLLEGE OF SURGEONS OF EDINBURGH, AND THE ROYAL FACULTY OF PHYSICIANS AND SURGEONS OF GLASGOW. The following candidates have passed the triple qualification examination:—

FINAL EXAMINATION.

Leslie Myers, J. T. F. Pearse, Hanna Barsoum, J. R. Martin, C. K. Row, R. N. Calvert, S. B. Brownsberger, G. A. Nelson, M. I. Mullen, Thilliampalam Ramasamy, H. A. Mohamed, P. A. P. Fennell, F. R. B. H. Kennedy, A. K. M. Attia, Chrysostom Joseph, Kandah Kanagasabapathy, W. F. Neville, Gerald Kahn, D. S. McMillen, J. H. Brush, C. H. Rowe, N. W. Laing, T. R. Jansen, Hugh Craig, Labib Malik-Mansour, E. L. Fraser, A. H. F. Arnott, Hope D. Lazarus, J. B. Cole, Hubert Gunaratna.

Medicine.—Y. A. R. Ezzat, William Stevenson, M. G. Lucas, Robert Cumming, L. H. Abeyewardine.

Surgery.—Anna G. McGregor, Y. A. R. Ezzat, M. A. Yousef, Velupillai Sivapragasam, B. A. D. Robert, Donovan Brink, A. B. O'Brien.

Midwifery.—Anna G. McGregor, Y. A. R. Ezzatt, M. A. Yousef, Ghanashyam Das, F. E. Smyth, L. O. Abeyaratne, Robert Cumming, Velupillai Sivapragasam.

Medical Jurisprudence and Public Health.—D. A. Black, T. A. M. Ashford, H. P. Lawson, J. G. Bryson, Jean G. Clark, M. A. Yousef, I. M. A. Ismail, E. O. Hagedorn, Cyril Bellamy, M. D. Evelyn, D. M. O'Flaherty, M. P. Moss, A. R. Hunt, M. U. Hayat.

The following candidates have also been successful:—

DIPLOMA IN PUBLIC HEALTH.

R. L. Mackay, Richard Norton, James Sharpe, Constance P. Hunter, Andrew Law, A. D. Mack.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.—At a quarterly meeting of the Council on Oct. 11th, with Sir Berkeley Moynihan, the President, in the chair, the diploma of Fellow was conferred upon Robert Milnes Walker, M.B. Lond., who has previously passed the requisite examinations and has now attained the age of 25 years. Diplomas of Member were also conferred upon the following who have previously passed the necessary examinations and have now complied with the by-laws, viz.: H. T. Flint, Westminster; H. Joomye, Middlesex; and Margaret C. Rosser, Birmingham.

Mr. Hugh Donald Fleming, lately a student at Epsom College, was nominated as the thirty-sixth Jenks Scholar.

The Bradshaw Lecture—on Axial Rotation, Purposeful and Pathological—will be given at the College at 5 P.M. on Thursday, Nov. 8th, by Mr. C. H. Fagge.

PRINCE OF WALES'S HOSPITAL.—The annual dinner of the Reunion Association will be held at the Trocadero Restaurant, Piccadilly Circus, London, on Thursday, Nov. 8th, at 7.45 for 8 P.M., with Dr. Charles Hadfield in the chair. The secretary of the Association is Dr. J. Browning Alexander, 42, Harley-street, W. 1.

UNIVERSITY OF LONDON MEDICAL GRADUATES' SOCIETY.—The next dinner of this society will be held at the Langham Hotel, London, W., on Wednesday, Oct. 31st, at 7.15 for 7.30 P.M., when the chair will be taken by Sir StClair Thomson. Members may invite medical graduates of the University as their guests. The hon. secretaries' address is 11, Chandos-street, W. 1.

UNIVERSITY COLLEGE HOSPITAL DINNER.—The annual dinner of past and present students was held at the Hotel Cecil on Oct. 12th. Surgeon Vice-Admiral Gaskell, Medical Director-General of the Navy and an old student of the hospital, was in the chair, and there were 230 guests present. The occasion marked the centenary of the medical school and the founding of an old students' club, and the gathering was therefore an extremely enthusiastic one. The Dean (Dr. A. M. H. Gray), in replying to the toast of the medical school, was able to give an impressive list of academic and other honours which had fallen to past and present students of the school during the year, and to announce an increase in the annual entry of new students for the forthcoming year. Dr. Herbert Spencer was elected president of the old students' club, and Dr. Glyn Hughes secretary. To the latter all communications relative to the club may be addressed at the Medical School, University-street, W.C. 1.

JOINT TUBERCULOSIS COUNCIL: DINNER TO CANADIAN SCHOLARSHIP TOUR.—British tuberculosis workers were hosts at a dinner given at Verrey's Restaurant, Regent-street, London, on Oct. 16th, to the members of the Canadian Tuberculosis Association on tour in Europe. The programme, which has included Paris, Nancy, Rome, Milan, Venice, and Leysin, is now nearly complete; after attending the conferences in London of the National Association for the Prevention of Tuberculosis (reported in another column), a final visit is to be paid to Edinburgh before the party sails for Montreal from Greenock next Saturday by the White Star liner *Calgaric*. The tour has been organised by Dr. J. H. Elliott, President, and Dr. R. E. Wodehouse, executive secretary of the Canadian Tuberculosis Association, who are conducting the members, many of whom owe their participation to a generous grant of scholarships for the purpose from the Sun Life Insurance Company of Canada. Sir Henry Gauvain presided at the dinner, which was attended by 47 guests with 104 hosts, many of the latter regretting that no guest could be allotted to them. Sir Henry, in proposing "The Guests," recalled the inspiring examples set by Osler and Trudeau, both of whom made it clear that there is no short way to the cure of tuberculosis. Organisation and team-work, such as may be seen at Detroit and Chicago, were essential to provide the elements of success; and he added a hope that our own insurance officials might follow the enlightened example of the Canadian Insurance Company in supporting antituberculosis effort. Dr. Wodehouse, who replied for the Canadian Association, said that its chief object was to interest the general practitioner in tuberculosis, for, said he, if we have him with us we are bound to win. The European visit would help Canada to make its own practice a little more uniform. Dr. Stuart Pritchard, of Michigan, responded for a number of American tuberculosis workers who accompany the party. Before the response Sir Henry called upon a number of representative tuberculosis workers in this country to support the toast, and a few well-considered remarks were made by Sir Robert Philip, Sir Oscar Warburg, Dr. G. Lissant Cox, Dr. C. O. Hawthorne, Dr. Marcus Paterson, Dr. T. N. Kelynack, Prof. S. Lyle Cummins, and Dr. Jane Walker. Dr. W. J. Dobbie, of Weston, Ontario, proposed "The Hosts," to which Sir George Newman and Dr. Ernest Ward, hon. secretary of the Joint Council, responded. Sir George looked forward to a time when the efforts of the Canadian Association would result in the building of an Empire free from the scourge of tuberculosis. Dr. Ward's witty reply defies summary. "The Sun Life Insurance Company of Canada" was proposed by Dr. Elliott, who spoke of periodic health examinations, and pictured what this principle might mean if universally applied in a young nation like Canada. Mr. T. B. Macaulay, President of the Company, in reply, feigned surprise at the meed of gratitude offered to him for the scholarships. A coöperation such as an insurance company was not, he said, free from the duties of good citizenship, and as his company happened to be prosperous it was supporting all worthy causes. £10,000 had been granted to try out the Calmette preventive treatment, and no single policy-holder had ever raised any objection to such grants. Sir StClair Thomson proposed "The Chairman," and the company rose at a late hour to sing Auld Lang Syne.

Medical Diary.

Information to be included in this column should reach us in proper form on Tuesday, and cannot appear if it reaches us later than the first post on Wednesday morning.

SOCIETIES.

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

MONDAY, Oct. 22nd.—8 P.M., ODONTOLOGY. Mr. G. Northcroft: The Desirability for the Establishment of a Rationalised Standard for the Prevention of Dental Disease in Children (Presidential Address). Casual Communication: Dr. Imrie: The Radiographic Appearance of Certain Specimens of Periodontal Disease in the Museum of the Royal College of Surgeons.

TUESDAY.—5 P.M., MEDICINE. A discussion on Hypochondria will be opened by Dr. R. D. Gillespie. Other speakers will be: Dr. C. P. Symonds, Dr. W. R. Reynell, Dr. T. A. Ross, Dr. R. S. Allison, Dr. Robert Hutchison.

WEDNESDAY.—5 P.M., COMPARATIVE MEDICINE. Sir John Moore: The Old and the New of Veterinary Science and Practice (Presidential Address).

THURSDAY.—8.30 P.M., UROLOGY. Mr. J. Swift Joly: The Cystoscope (Presidential Address).

FRIDAY.—5 P.M., CHILDREN. (Cases at 4.30 P.M.) Short Paper: Prof. Taillens (Lausanne): Dyspepsia in Childhood. 8 P.M., EPIDEMIOLOGY. Dr. F. E. Fremantle: The Authority of Parliament in Relation to Epidemic Disease (Presidential Address).

MEDICAL SOCIETY OF LONDON, 11, Chandos-street, Cavendish-square, W.

MONDAY, Oct. 22nd.—8.30 P.M., Discussion on the Diagnosis and Treatment of Empyema, to be introduced by Dr. C. E. Lakin and Mr. A. Tudor Edwards.

HARVEIAN SOCIETY OF LONDON.

THURSDAY, Oct. 25th.—4.30 P.M. (at the Paddington Green Hospital), Clinical Meeting.

LONDON CLINICAL SOCIETY.

THURSDAY, Oct. 25th.—8.30 P.M. (at London Temperance Hospital), Annual General Meeting and Clinical Evening. All practitioners invited.

MEDICO-LEGAL SOCIETY.

THURSDAY, Oct. 25th.—8.30 P.M. (at 11, Chandos-street, Cavendish-square, W.), Dr. Godfrey Carter: Status Lymphaticus or Lymphatism, followed by a discussion.

ST. JOHN'S HOSPITAL DERMATOLOGICAL SOCIETY.

WEDNESDAY, Oct. 24th.—4.15 P.M. (at St. John's Hospital, 49, Leicester-square, W.C.), Clinical Cases.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

ROYAL COLLEGE OF SURGEONS OF ENGLAND, Lincoln's Inn-fields, W.C.

MONDAY, Oct. 22nd.—5 P.M., Mr. T. W. P. Lawrence: Demonstrations of Surgical Specimens.

FRIDAY.—5 P.M., Sir Arthur Keith: The Development of the Human Foot and its Bearing on Club-foot (Illustrated by specimens.)

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.

MONDAY, Oct. 22nd, to SATURDAY, Oct. 27th.—FELLOWSHIP OF MEDICINE, Medical Society of London, 11, Chandos-street, Cavendish-square, W. Mon. at 5 P.M.: Lecture by Mr. E. G. Slesinger: Fractures at the Wrist. Free to members of the medical profession.—CENTRAL LONDON THROAT, NOSE AND EAR HOSPITAL, Gray's Inn-road, W.C. Intensive course.—HOSPITAL FOR SICK CHILDREN, Great Ormond-street, W.C. Special course, mornings only.—LONDON SCHOOL OF TROPICAL MEDICINE, Endsleigh-gardens, W.C. Tues. and Thurs.: Lecture-demonstrations.—ROYAL NORTHERN HOSPITAL, Holloway-road, N. Tues. at 4 P.M.: X Ray Demonstration by Dr. C. Gouldesbrough. No fee.—CANCER HOSPITAL, Fulham-road, S.W. Fri. at 2.30 P.M.: Demonstration by Mr. P. P. Cole. No fee.—WELLCOME MUSEUM OF MEDICAL SCIENCE, 33, Gordon-street, W.C. Wed. at 4 P.M.: Dr. Donald Hunter: Portals of Entry in Tuberculosis: Morbid Anatomy and Some Clinical Aspects. Free to members of the medical profession. Further particulars from the Secretary.

UNIVERSITY COLLEGE, Gower-street, W.C.

MONDAY, Oct. 22nd.—5 P.M., Prof. E. B. Verney: Urinary Secretion. (Second lecture.)

FRIDAY.—5 P.M., Prof. J. C. Drummond: Recent Work on Vitamins. (Third lecture.)

ROYAL INSTITUTE OF PUBLIC HEALTH, 37, Russell-square, W.C.

WEDNESDAY, Oct. 24th.—4 P.M., Dr. W. J. O'Donovan: Occupational Cancer of the Skin.

HOSPITAL FOR SICK CHILDREN, Great Ormond-street, W.C.

THURSDAY, Oct. 25th.—4 P.M., Mr. Doyne Interstitial Keratitis.

ROYAL NORTHERN HOSPITAL, Holloway-road, N.

TUESDAY, Oct. 23rd.—3.15 P.M., Mr. E. Wolff: The Oculo-motor Nerve.

WEST LONDON POST-GRADUATE COLLEGE, West London Hospital, Hammersmith, W.

MONDAY, Oct. 22nd.—10 A.M., Dr. Dowling: Skin Department. 11 A.M., Mr. Tyrrell Gray: Surgical Wards. 2 P.M., Mr. Simmonds: Surgical Out-patients. 4.30 P.M., Dr. Archer (demonstration): Analysis of Blood and Urine.

TUESDAY.—11 A.M., Mr. Endean: Venereal Diseases (demonstration). 2 P.M., Dr. Shaw: Medical Out-patients.

WEDNESDAY.—10 A.M., Dr. Burnford: Medical Wards. 2 P.M., Mr. Tyrrell Gray: Operations. 2.30 P.M., Mr. Donald Armour: Surgical Wards.

THURSDAY.—10 A.M., Dr. Grainger Stewart: Neurological Department. 2 P.M., Dr. Ironside: Medical Out-patients. 2 P.M., Mr. Bishop Harman: Eye Department.

FRIDAY.—10 A.M., Dr. Pritchard: Medical Wards. 2 P.M., Mr. Sinclair: Surgical Out-patients. 2 P.M., Mr. Vlasto: Throat, Nose and Ear Department. 4.30 P.M., Dr. Archer: Analysis of Blood and Urine.

SATURDAY.—9 A.M., Mr. Vlasto: Operation on Throat, Nose and Ear. 9.30 A.M., Dr. Burnford: Bacterial Therapy Department. 10 A.M., Dr. Owen: Medical Diseases of Children.

Daily, 10 A.M. to 5 P.M., Saturdays 10 A.M. to 12 noon. Medical and Surgical In-patients and Out-patients. Operations, Special Departments, Anæsthetic Course.

NORTH-EAST LONDON POST-GRADUATE COLLEGE, Prince of Wales's General Hospital, Tottenham, N.

MONDAY, Oct. 22nd.—2.30 to 5 P.M.: Medical, Surgical, and Gynæcological Clinics. Operations.

TUESDAY.—2.30 to 5 P.M.: Medical, Surgical, Throat, Nose and Ear Clinics. Operations.

WEDNESDAY.—2.30 to 5 P.M.: Medical, Skin and Eye Clinics. Operations.

THURSDAY.—11.30 A.M.: Dental Clinics. 2.30 to 5 P.M.: Medical, Surgical, and Ear, Nose and Ear, Nose and Throat Clinics. Operations.

FRIDAY.—10.30 A.M.: Throat, Nose and Ear Clinics. 2.30 to 5 P.M.: Surgical, Medical, and Children's Diseases Clinics. Operations.

ST. PAUL'S HOSPITAL POST-GRADUATE COURSE, Endell-street, W.C.

WEDNESDAY, Oct. 24th.—4.30 P.M., Mr. R. H. Jocelyn Swan: Tuberculosis of the Urinary Organs.

ANCOATS HOSPITAL POST-GRADUATE LECTURES, Mill-street, Manchester.

THURSDAY, Oct. 25th.—3.45 P.M., Mr. Diggle: Common Ailments of the Ear, Nose and Throat.

MANCHESTER ROYAL INFIRMARY POST-GRADUATE COURSE.

TUESDAY, Oct. 23rd.—4.15 P.M., Sir Berkeley Moynihan: Some Problems in Gastric Surgery. (Lloyd Roberts Lecture.)

FRIDAY.—4.15 P.M., Prof. J. S. B. Stopford: Prognosis after Nerve Suture.

Appointments.

ANDERSON, C. A., L.R.C.P. Lond., M.R.C.S., has been appointed Certifying Surgeon under the Factory and Workshop Acts for Sandwich.

BANKS, CYRIL, M.B., B.S. Lond., D.P.H., Medical Officer of Health for Nottingham.

CLARKE, T. H., M.B., M.R.C.S., D.L.O., Honorary Surgeon to the Ear, Nose and Throat Department of the Kent and Canterbury Hospital.

CRITCHLEY, M., M.D. Bristol, M.R.C.P. Lond., Assistant Physician, National Hospital, Queen-square, W.C.

MACDONALD, E. K., M.D., B.S. Lond., Medical Officer of Health and School Medical Officer for Keighley.

Vacancies.

For further information refer to the advertisement columns.

Aylesford, Kent, British Legion Village, Preston Hall.—Res. H.P. £100.

Barnsley County Borough.—Asst. M.O., &c. £600.

Birkenhead General Hospital.—Sen. H.S. £150.

Birmingham General Hospital.—Res. Surg. O. £180.

Birmingham, Queen's Hospital.—Res. Surg. O. £100.

Bradford Royal Infirmary.—H.S. and H.P. Each £150.
Brighton, Sussex Maternity and Women's Hospital.—Res. H.S. £130.
Bristol, Royal Hospital for Sick Children and Women, St. Michael's Hill.—H.S. and H.P. Each £125.
Cancer Hospital, Fulham-road, S.W.—H.S. At rate of £100.
Cardiff, Glan Ely Tuberculosis Hospital, Fairwater.—Asst. Res. M.O. £200.
Charing Cross Hospital, W.C.—Res. M.O. £350.
Chester Royal Infirmary.—Honorary Surgeon.
Chesterfield Borough.—M.O.H. £900.
Chesterfield and North Derbyshire Royal Hospital.—Res. Surg. O. £300.
Dunedin, New Zealand, Otago University.—Professor of Pathology. £1000.
East Ham County Borough.—Asst. M.O. £600.
Elizabeth Garrett Anderson Hospital, Euston-road.—Ophthalmic S. Also Asst. S. to Throat, Nose and Ear Dept.
Hospital of St. John and St. Elizabeth, 60, Grove End-road, N.W.—Res. H.P. At rate of £100.
Huddersfield, Bradley Wood Sanatorium, &c.—Res. M.O. £500.
Hull Royal Infirmary.—Asst. H.P. At rate of £130.
Ilford Emergency Hospital, Essex.—Jun. H.S. £90.
Lahore, King Edward Medical College.—Prof. of Physiology, Rs.1200–50–2100.
Leicester Royal Infirmary.—2nd Res. Anæsthetist. At rate of £250.
London Homœopathic Hospital, Great Ormond-street, W.C.—Three Res. M.O.'s. Each at rate of £100.
Maudsley Hospital, Denmark Hill, S.E.—Asst. M.O. £300.
National Hospital, Queen-square, W.C.—Registrar. £200.
Oswestry, Shropshire Orthopædic Hospital and Agnes Hunt Surgical Home.—H.S. £200.
Royal Eye Hospital, St. George's-circus, Southwark, S.E.—Res. H.S. and Asst. H.S.
Royal Waterloo Hospital for Children and Women, Waterloo-road, S.E.—H.S. At rate of £100.
St. Thomas's Hospital, S.E.—Asst. Pathologist. £450.
Salisbury General Infirmary.—Res. M.O. £150.
Samaritan Free Hospital for Women, Marylebone-road, N.W.—Reg. £100.
Shanghai Municipal Council.—P.H. Dept. Asst. Radiologist. 700 Taels a month.
Sheffield University.—Asst. Bacteriologist. £300.
Winchester, Royal Hampshire County Hospital.—Sen. Res. M.O. £200.

The Chief Inspector of Factories announces a vacancy for a Certifying Factory Surgeon at Loughor (Glamorganshire).

Births, Marriages, and Deaths.

BIRTHS.

BUTTERY.—On Oct. 11th, at Grimston-avenue, Folkestone, the wife of J. W. D. Buttery, F.R.C.S. Edin., of a son.
IMRIE.—On Oct. 9th, at a nursing home, Sheffield, the wife of Dr. C. Gray Imrie, Fulwood-road, Sheffield, of a daughter.
MATHEWS.—On Oct. 8th, at Kirkby Lonsdale, the wife of Richard G. Mathews, M.B., B.Ch., of a daughter.

MARRIAGES.

WHITLOCK—WELLS.—On Oct. 6th, at St. George's, Hanover-square, Denis Banes Whitlock, F.R.C.S. Edin., of Bromley, Kent, to Sylvia Mary Wells, daughter of Mr. and Mrs. Leonard Wells, C.C., of Shortlands.
WIGGLESWORTH—SEMPLE.—On Oct. 3rd, at St. Saviour's Church, St. Albans, Dr. V. Brian Wigglesworth, M.A., B.Ch., to Mabel Kathleen, second daughter of Lieut.-Colonel Sir David and Lady Semple, Claremont, Battlefield-road, St. Albans.

DEATHS.

ALLISON.—On Oct. 8th, after a short illness, Thomas Moffatt Allison, M.D., of Eldon-place, Newcastle-on-Tyne.
CHURCHILL.—On Oct. 10th, at Tirley, Priests-lane, Brentwood, Essex, Surgeon-General A. F. Churchill, late Army Medical Staff, in his 90th year.
MACKAY.—On Oct. 14th, at The Cloisters, Knaresborough, Dr. Ian Donald Mackay, aged 66 years.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

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Notes, Comments, and Abstracts.

A SUMMARY OF RECENT WORK ON VIGANTOL

(IRRADIATED ERGOSTEROL).

BY DR. W. PFANNENSTIEL,

PRIVAT-DOCENT IN THE UNIVERSITY OF MUNSTER (WESTF.).

RESEARCHES by the English and American workers, A. F. Hess, Weinstock and Helman, Steenbock and Black, Rosenheim and Webster, and others, have shown that lipoid-containing foods (such as oils, milk, flours, or meat) can take on antirachitic properties as the result of exposure to the energy of short-wave rays of 275–300 $\mu\mu$. To all appearance, therefore, the process of irradiation is able to transform an inactive lipoid substance—a "pro-vitamin" (Windaus)—contained in these foodstuffs into active vitamin D.

Vitamin and Pro-vitamin.

This important discovery led to endeavours to define the pro-vitamin chemically. It is deserving of special mention that to this end an international coöperation of English, American, and German investigators was instituted, which has proved extraordinarily fruitful. As a result of the joint labours of O. Rosenheim (London), A. F. Hess (New York), and A. Windaus (Göttingen), the antirachitic active principle was discovered and a pro-vitamin prepared chemically pure for the first time. The vitamin has never been got chemically pure; according to Rosenheim only 10 per cent. of it is present at any given time.

The pro-vitamin proved to be an unsaponifiable substance belonging to the sterol fraction. This occurs in all animal organisms, and can be converted, by irradiation of the living animal with ultra-violet light, into active vitamin D, such as is already normally present, in particular, in cod-liver oil. Thus it became possible to trace the therapeutic effect on rickets of cod-liver oil (E. Mellanby) and of irradiation with natural or artificial sunshine (K. Huldschinsky) to the influence of the same chemical force. In the first case the ready-made active vitamin is administered by the mouth and comes immediately into action; in the second case the active vitamin D is synthesised, by means of the irradiation, out of the pro-vitamin present in the organism. The chief physiological action of the vitamin apparently consists in a counterbalancing of the ion-equilibrium between Ca^{11} and PO_4^{111} which is necessary for regular bone-formation (Freudenberg and György).

When it had been determined that the pro-vitamin is a sterol, further efforts were made to isolate vegetable and animal sterols capable of being changed by ultra-violet irradiation into active antirachitic agents. Up till a short time ago—largely by reason of the experiments of A. F. Hess, who had succeeded in activating cholesterol by irradiation—it was in the latter substance that the precursor of the active principle had been sought. O. Rosenheim and, independently, Pohl were able to produce evidence, however, that cholesterol itself is not to be regarded as the pro-vitamin. The deciding factor in this assumption—apart from the fact that every cholesterol could not be activated in the same way—was the demonstration by spectro-metric methods of the presence, in admixture with cholesterol, of a substance with quite characteristic absorption bands. According to investigations by A. Windaus, this substance is identical with ergosterol ($C_{27}H_{42}O$, showing three double bonds).

The ergosterol which occurs as an impurity in cholesterol, in the proportion of 1/20,000–1/50,000, loses its characteristic absorption and likewise its precipitability by digitonin (Windaus), as the result of ultra-violet irradiation, and acquires antirachitic properties. Cholesterol freed from ergosterol, it was found, could no longer be activated by irradiation.

It has not yet been made clear what are the chemical or physico-chemical changes resulting from irradiation which enable ergosterol to change into vitamin D. Presumably the process which takes place under the action of the rays depends on a steric transposition or a displacement of the double bonds. Oxidative processes probably do not come into the question, as on the one hand experiments by Hess, Rosenheim, and György have shown that oxygen is able to destroy the antirachitic properties of irradiated ergosterol, and, on the other hand, activation can be successfully produced even when oxygen is excluded.

The discovery of Windaus that the pro-vitamin is to be found in ergosterol made it possible to prepare the anti-rachitic active principle in a pure condition. For ergosterol can be comparatively easily obtained from the sterol of fungi—e.g., ergot—and more particularly from yeast. In the lower plants, as in the algæ of the marine plankton, ergosterol activated by the sun's rays is probably already present. From the plankton the cod probably gets, with its food, the active principle found in cod-liver oil. According to researches by A. Adam, the antirachitic vitamin can be obtained from cod-liver oil by fractional extraction with acid alcohol. These acid extracts show extensive agreement with the spectrum of irradiated ergosterol, which is maintained also after precipitation with digitonin. In all probability, therefore, the active principle in cod-liver oil is identical with that of irradiated ergosterol. Further, the spectrum of insulin also shows an extensive degree of resemblance to that of irradiated ergosterol. Insulin, according to E. Vogt, who has recently directed attention to the relationship between hormones and vitamins, also has its activity increased by irradiation.

Through suitably dosed ultra-violet irradiation any pure ergosterol acquires excellent antirachitic properties. According to Pohl, the light from a magnesium arc is extremely good for the optical transformation of ergosterol, on account of the particularly good spectral dispersion of its energy.

In Germany the E. Merck Chemical Works, Darmstadt, and the I. G. Farbenindustrie-Aktiengesellschaft, Leverkusen, have undertaken the preparation, on a manufacturing scale, of activated ergosterol. The product prepared by these firms under constant biological control as to its efficacy in animal tests bears the name of vigantol.

Animal Experience.

In rats in which rickets has been artificially produced by means of vitamin-free diet, daily administration of a very small dose (1/1000–1/10,000 mg.) of irradiated ergosterol is able to bring the disease-process to a standstill within eight days—as has been shown by the experiments of Rosenheim and Webster, Windaus and Hess, F. Holtz, H. Vollmer (who also employed parenteral administration), and others. By means of further doses, complete healing could be obtained. In puppies with artificially induced rickets, Hottinger was able to produce exactly the same curative effects by the administration of irradiated ergosterol. In all cases the process of healing could be plainly followed by rontgenography and blood-chemical tests.

The effects of deficiency of vitamin D on the full-grown animal organism have been investigated by W. Eichholz and H. Kreitmair. Their results showed an obvious lowering of resistance to infectious diseases in rats and mice which had received a diet free from vitamin D for a period of three to five weeks. When mice fed in this way were infected with pneumococci, 80–100 per cent. of the animals succumbed to the infection, while of normally fed control animals similarly infected only about 60 per cent. died. The same reduction in the rate of mortality could also be obtained, however, when the animals fed on the vitamin-D-free diet received daily 1/1000 mg. of vigantol or some brewers' yeast. When vigantol and yeast were administered together the mortality-rate fell still further to about 37 per cent. By the simultaneous administration of vitamins D and B, therefore, the resistance to pneumococcal infection of mice fed on a rickets-producing diet is actually increased to above the normal.

The latter observation is in full accord with experiments which I carried out in healthy full-grown rabbits. When these received, for a period of six weeks, an addition of cod-liver oil to their normal diet, and afterwards an addition of yeast, their serum at the end of the feeding period showed a pronounced increase in its power to kill typhoid bacilli, an increase which was of notably long duration. From the addition of yeast, cod-liver oil, or lemon juice alone to the diet, on the other hand, no noteworthy increase in bactericidal power could be observed in the serum. It appears, therefore, that the various vitamins are able reciprocally to reinforce each other's action. While the vitamins A, D, B, and C contained in foodstuffs exercised, by themselves, no definite influence, an increase in the bactericidal capacity of the serum was successfully obtained, in young healthy rabbits, by the daily administration of very small doses of vigantol. Over-dosage, or prolonged administration of vigantol, in the rabbit led, however, to loss of weight and in some cases to death with symptoms of very severe cachexia. The latter observations show that in non-rachitic animals the administration of excessive doses of irradiated ergosterol may result in injurious effects, which are, perhaps, to be interpreted as a hypervitaminosis. H. Kreitmair and Th. Moll also found that in animals of various types fatal poisoning could be produced experimentally through excessive doses of vigantol. The authors therefore warn against the indiscriminate administration of large doses.

Human Experience.

In the human subject irradiated ergosterol was first used with success in Germany by György. He found, as did also Beumer and Falkenheim, that the daily administration, over a period of four weeks, of 2–4 mg. was effective, and resulted in the complete removal, demonstrable by blood-chemical and rontgenological examination, of the rachitic changes. Further tests gave similar results, and showed that the commercially prepared irradiated ergosterol, vigantol—both in fluid form (dissolved in olive oil) and in the form of ovoids and pellets—also almost always brings about healing of rickets in children within a short time (Pfaundler, G. Prinke, Seckel, F. Sachs, H. Völckers and Blum, C. Falkenheim, W. Lasch and A. Behrens, A. Hottinger, H. Vollmer, W. Beck, W. Knoepfelmacher, H. Strote, H. Schlossmann, J. Aengenendt, &c.). It was found that by means of doses of 2–4 mg. of vigantol a therapeutic effect could be obtained at least equally as good as that from mountain sun irradiation or the administration of cod-liver oil. The tetany which is frequently associated with rickets generally disappears in no more than from eight to ten days, the blood phosphorus rises to normal within 14 days, the activity and liveliness of the children increases, the sweats disappear, the appetite visibly improves, the anæmia slowly retrogresses, and at the end of 35–56 days recovery is complete.

H. Vollmer found that long before the blood-phosphate had risen to normal, deposits of lime in the epiphyses were already rontgenologically demonstrable. By the daily administration of higher doses (5–10 mg.), according to Vollmer, the process of healing could be still further accelerated. In such cases the unusually high phosphate values after the conclusion of the treatment were striking. On the other hand, no definite healing was obtained by short courses (5–6 days) of still higher doses (about 20 mg. daily). Only continued treatment with small doses led to the desired result.

In connexion with these observations, the investigations carried out by C. Kroetz in four healthy male adults are of interest. To these men, after some weeks on hospital diet, a definite and uniform standard diet was given for two to three days before the experiment, and then 18–30 mg. of vigantol were given daily for seven to eight days. No change in the general condition or in the body-weight resulted. The acid-base equilibrium also did not appear noticeably affected. On the other hand, the mineral balance in the excretions underwent pronounced changes as a result of the administration of vigantol. The renal excretion of P was slightly, and of Cl and H_2O markedly increased, the serum-phosphate level sank, and recognisable blood-acidosis set in. The metabolic change thus obtained by liberal administration of ergosterol in the healthy adult proved, therefore, to be the opposite of that which is produced by small doses in the rachitic child. This observation is the more worthy of notice because it contains in itself the possibility that large doses, as compared with small doses, may produce opposite effects in man, just as in the rabbit. Possibly, however, the reaction of the rachitic human organism to vigantol is different, in principle, from that of the healthy organism.

This requires particularly to be taken into consideration in the prophylactic use of vigantol. When the beginnings of rickets are already present, however, treatment with irradiated ergosterol has proved eminently effective. The rickets which experience shows to occur, almost without exception, in prematurely born infants and in twins, even in the summer months, could be prevented, according to the investigations of Vollmer and of Lasch and Behrens, by daily doses of 1–3 mg. of vigantol.

The effect which irradiated ergosterol exercises on the organism as a whole is in all probability bound up with an improvement in the condition of immunity. This appears on the one hand from the above-mentioned experiments on animals, and on the other from observations by C. Falkenheim, W. Beck, and others, who saw striking improvement produced also in the broncho-pneumonia with which rickets is frequently complicated.

P. György, W. Starlinger, M. Sternberg, and A. Hottinger all report further that they have also obtained curative results in cases of severe osteomalacia from the daily administration of 3–10 mg. of vigantol. These results were obtained, however, only after months of treatment, considerably later, therefore, than in the rickets of children.

Apart from rickets and osteomalacia, there appears to be every likelihood that other affections can also be beneficially influenced by the administration of irradiated ergosterol. Investigations made by R. Seyderhelm and H. Tammann in dogs with biliary fistulæ make it extremely probable that not only the lime and phosphate metabolism but also the production and disintegration of erythrocytes are regulated by the direct or indirect action of substances of

the structure of irradiated ergosterol. Like the bile-acids, activated ergosterol was found to be able to improve or cure the anæmia of biliary fistula in dogs. On the basis of these experiments, G. Rosenow has already sought to influence pernicious anæmia in man with combined liver diet and vigantol treatment, and in some cases has obtained noteworthy results. Stern reports a case of tetania parathyreopriva, and Birkholz two cases of ozæna, which were favourably influenced following the use of vigantol. According to observations of E. Bors and I. G. Knopflach the formation of callus in fractures of the bone was hastened by the action of vigantol.

Conclusion.

It may be said that the discovery that irradiated ergosterol can function as vitamin D—better, "vitasterin" D (Kroetz), since it contains no amine—or is identical with it must be esteemed one of the most important results of research in our time. Particularly gratifying is the fact that, for the first time since the world war, English, American, and German investigators have, by joint work, shared in this discovery. Irradiated ergosterol (vigantol) has proved its value as a "curative and protective antirachitic agent" (Pfaundler, Rietschel). To-day nothing stands in the way of its widespread use.

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TRANSFER OF PANEL PATIENTS.

A CORRESPONDENT writes: "I joined the panel when the Insurance Act first came into force, and the county-town panel in 1918. If I now sell my practice, I understand that my panel patients are notified by the Insurance Committee that they will be transferred to my successor unless they object. Is this correct? Further, I am told that all panel patients are put on an unallocated list and the purchaser only gets those who sign for him. Is this correct?"

The answer to both questions, if we understand them correctly, is in the affirmative. The change in the regulation for the transfer of panel practices dates from 1920. Before that time the panel was transferred to the purchaser with the exception of those insured persons who notified the Insurance Committee of their wish to exercise their right of free choice. Now, every insured person is offered the choice of a fresh doctor, and only those who choose the purchaser are put on his list. Others may be allotted at a later date if they have not chosen. The notices issued to insured persons on the seller's list take this form: (1) There is a paragraph setting out the regulation under which everyone is removed from the list and given the right of free choice; (2) they are all informed that Dr. A. has sold his practice to Dr. B., who is willing to accept any of them on his list. We may cite, as an illustration of what happens under present arrangements, a death vacancy in which there were 2400 on the panel list. Three weeks after the notices had been sent out, 1200 had signed cards to go on the purchaser's panel. Only a small percentage had given notice of fresh choice and transferred to a neighbouring doctor's list. It seems that these notices are not understood by all; some interpret it as meaning that they must make a fresh choice, and many wait until they require treatment before taking any action. The residue, who have given no indication of a desire to change, are allocated, after a period varying in the different areas, to the list of the nearest practitioner, which in the majority of cases would be that of the purchaser.

THE SPECIAL TRAINING OF THE MENTAL NURSE.

Now that attendance at lectures is practically compulsory for all mental nurses, and their promotion depends largely on examination results, text-books are needed to supplement the standard handbook for mental nurses published by the Royal Medico-Psychological Association. It is unfortunate that the educational equipment of many probationers is insufficient to grasp much that is given in the handbook. Probably the only solution is a course of preliminary education, for it is certain that no one can aspire to nurse mental disorders satisfactorily without possessing a wider outlook than that given in our elementary schools. Mental nursing surely requires the highest qualifications of any branch of nursing, and seeing that the men and women who seek employment as nurses in our public mental hospitals are often lamentably deficient in general education, it might even be a wise policy for the state to organise preliminary courses of training before requiring the young nurse to attempt any technical education in her specialty.

A little book[1] published under the auspices of the National Asylum Workers Union and written by a medical officer whose name is not given, claims to be a complete series of lectures for the mental nurse. A cautious foreword by Prof. Shaw Bolton commends the book to the probationary nurse and congratulates the Union on the attempt to cater for the needs of its members, which he considers "deserves the whole-hearted support of every mental nurse." The book is uneven and gives little indication of a broad vision as to the scope of mental nursing. Seventy pages are taken up by general anatomy, physiology, the symptoms of disease, and sick nursing. Then follows 20 pages, one-fifth of the whole book, of description of the nervous system, and lastly, 20 pages are devoted to an account of mental disorders, and to mental nursing proper; five are concerned with psychoanalysis. The description of the nervous system is well done, but it is doubtful whether nurses could possibly understand it without opportunities of seeing dissections and demonstrations from models. The book is inadequate when we come to mental nursing proper. The nursing of dementia præcox is disposed of in a dozen lines and nothing could be more discouraging than the statement that "mentally, much can be done to stave off apathy and stupor by interesting the patient in his surroundings in the early stages, but sooner or later he will pass beyond such means of treatment." This defeatist doctrine does not help nurse or patient. The treatment of mania and melancholia is allotted 15 lines and

[1] Notes for the Mental Nurse in Training. By a Medical Officer of a Mental Hospital. Manchester: Express Co-op. Printing Co. Pp. 113. 1s.

general paralysis 22 lines. There are several serious omissions. For example, the chapter on first aid gives no instruction for the treatment of wounds; the principles of asepsis are not mentioned, nor is the nurse told how to clean a catheter. The book has no index.

The effort to help the mental nurse to understand her work is commendable, but in our view it is a mistake to attempt to cover all this ground in a single volume. The more condensed a subject, the more difficult it is to grasp. Condensation suggests learning by heart, and the storing in the mind of words without understanding. It would be better to prepare several independent little volumes dealing with different aspects of mental nursing and to omit subjects, such as anatomy and first aid, which are adequately dealt with in easily accessible manuals. The section on the anatomy of the nervous system would form the basis of an excellent little volume of this kind, and several other chapters, if expanded, could be used with advantage in such a series.

DIET HELPS FOR DOCTORS.

DESPITE the attention that one understands is given to diet in the United States, things must still be far from satisfactory if some of the statements set out in Diet Helps for Doctors (issued by the Battle Creek Food Company) are to be taken as written. For example: "More than half the people in the United States are suffering from anæmia," "half the population are suffering from lime starvation," "rickets, a disease which does injury to full three-fourths of all children in a large section of the United States." Nor can it be accepted without protest that constipation is "almost universal among civilised people." The first part of this small brochure contains a number of useful tables regarding foods, their caloric values, and the amounts required at various ages and in various occupations. Several diseases are then discussed, a brief review of the pathology being followed by hints on the construction of suitable diets with complete lists of the foodstuffs advised. There is a chapter on feeding in diabetes, with a scheme for building up a diet, and comprehensive lists of the caloric value and carbohydrate content of articles most usually met with at the table. The section on constipation is well written, though it contains a plea for three to four evacuations a day, which seems excessive. Too little emphasis is laid on the value of regular habit in this connexion and rather too much reliance placed on the gastro-colic reflex. In many people the bowels are emptied immediately after rising, before any food is taken; this seems a preferable method and one which depends entirely on habit. We are apt to associate rapidity of movement with our friends in America, and apparently their alimentary canals are also in a permanent hurry, since we are told that "four hours from the time the breakfast is eaten the unused residue has reached the ileo-cæcal valve." Many British stomachs are not empty till between three and a half to four hours after a meal. Perhaps there is some connexion between this gastric sloth and the relative slowness that our lay press deplores in its comments on the sportsmen of two countries; in this book, at any rate, athletes are grouped with savages and healthy children as being among those who "move their bowels three times a day or oftener," being second in this respect only to the large apes.

Apart from these peculiarities the handbook contains much sound common sense and should prove a real help in constructing a diet. It is well printed and has some ingenious illustrations; the diet tables for the various diseases are well planned and easy to understand. The book bears out the claim, made in the foreword, that it is "a brief compilation . . . which any progressive physician will be glad to have at hand for ready reference."

GYNÆCOLOGY AND OBSTETRICS IN LIVERPOOL UNIVERSITY.

THE attention of clinical gynæcologists and obstetricians is drawn to a monograph by Prof. W. Blair Bell on the Material and Methods of the Gynæcological and Obstetrical Department in the University of Liverpool.[1] This recently appeared in four parts in the *Journal of Obstetrics and Gynæcology of the British Empire*. It presents an intimate account, illustrated with many photographs and plans, of an organisation and a technique that have been built up by experts to fulfil a definite practical purpose. Prof. Blair Bell here describes his personal ideas and their fruition in the hope of stimulating others to that healthy rivalry from which progress springs.

The practical utility of the department is proved by the demands made upon it, for, in spite of its unusual size, its accommodation is taxed to the utmost. It contains museums, laboratories, research rooms, an animal house, a lecture theatre, photographic rooms, the professor's room and a secretary's room, and is separated from the wards in the Royal Infirmary only by a passage 95 yards long. The pathological specimens in the teaching museum are arranged according to the classification of the patients' case-cards in the hospital; the descriptive placards aim at correlating the symptoms and history of the case with the specimen itself. The cataloguing and labelling scheme is very highly organised, and close attention is paid to detail. The walls are hung with framed photographs and coloured pathological diagrams, and there is a fine set of radiograms of abnormal conditions of pregnancy. Many obstetrical specimens are mounted in plaster-of-Paris under liquid paraffin in large flat-bottomed porcelain receptacles resembling plunge-baths, with plate-glass covers. This method makes it easy to see and photograph the specimens.

The routine work of simple pathology, bacteriology, and biochemistry is done in the director's laboratory, but more advanced work goes to the professors of biochemistry or pathology. The necessary work of photographing and drawing specimens is efficiently provided for. The teaching arrangements are in a transitional stage owing to the introduction of the new curriculum, but Prof. Blair Bell has already shifted a large amount of the gynæcological and obstetrical instruction to the fifth year to allow students to complete their ordinary surgical dressing and medical clerking before approaching his subject in earnest. The systematic lectures begin with the summer of the fourth term (two a week), are continued through the autumn and Lent terms (three a week), and close with the summer term of the fifth year (two a week). There are about 70 in all. The complete outfit for delivering this course, with 1147 slides, 62 subject-heading cards, and 205 illustrative cards, can be obtained from the publishers of the *Journal* for £95.

Individual research is regarded as an obligation on each member of the staff, and workers have at their disposal valuable instruments and skilled assistants, with the personnel as their mouthpiece. Collective research, for problems which require team-work, is organised with the coöperation of the heads of the various departments, each of whom receives a small honorarium from a special fund, and the help of whole-time workers and laboratory assistants according to the necessities of the work. Interim reports are issued to the whole staff. The professor of obstetrics and gynæcology is director in the first collective research organised by him for the study of malignant disease, and his department is used as a clearing-house. Staff meetings are held periodically. He hopes to make the organisation a permanent University scheme, and to attack other problems, such as the toxæmias of pregnancy, which are likely to be solved only by collective investigation. The brochure also gives a detailed account of the technique in use in the wards and theatre.

CANE SUGAR AS A REMEDY.

To the Editor of THE LANCET.

SIR,—Some years ago[1] Mr. Henry Curtis recommended intramuscular injections of cane sugar in phthisis. Injections are troublesome, so I tried administration by the mouth, and being in China at the time I had to conceal the nature of the drug owing to a local superstition. This led to the addition of ammoniated quinine. On returning to England I found that some brands of sugar on the market did not work, so I consulted a chemist who suggested yellow demerara as the purest form of cane sugar easily obtained. This I found satisfactory, except that at first I had to face a hostility to yellow sugar similar to that which exists against brown flour. But the results obtained speedily convinced the objectors. In influenza colds, heart cases, lung cases, and for delicate children I use the following prescription, slightly varied to meet the special needs of the patient: One or two teaspoonfuls of demerara sugar dissolved in a small glass of hot water, to which is added either half to one teaspoonful of tincture of ammoniated quinine or, in heart cases, the same amount of sal volatile. In the case of children it is taken neat. Those who prefer an effervescent drink may add a pinch of bicarbonate of soda and tartaric acid. The winter is just coming, and those who freely take above need have no fear of colds. I usually prescribe it before meals, but any time will do. On arriving home wet and cold from a round, I take a dose at once.

I am, Sir, yours faithfully,

Oct. 16th, 1928. C. G. S. BARONSFEATHER, M.D.

*** The late Dr. Arthur Goulston was a consistent advocate of the beneficial effects of cane sugar on the myocardium.

[1] Manchester: Sherratt and Hughes. 1928. Pp. 61.

[1] THE LANCET, 1919, i., 636.